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Disease resistance in French Beans.—*Fruit World, Melbourne*, xxxviii, 12, p. 24, 1937.

In a crop-growing competition in New South Wales French beans [*Phaseolus vulgaris*] of the Burnley selection of Canadian Wonder, a variety which has been widely planted locally because of its alleged high resistance to bacterial blight [*Bacterium phaseoli*], while showing some resistance to the disease, were more susceptible to other disorders, including anthracnose [*Colletotrichum lindemuthianum*] and mosaic, than Tweed Wonder growing in adjacent plots. Growers are strongly advised not to sow a large area with any much-advertised new variety until they have determined by a small test whether it is suitable to their local conditions.

WALKER (J. C.). **Onion diseases and their control.**—*Fmrs' Bull. U.S. Dep. Agric.* 1060, 24 pp., 15 figs., 1937.

A popular description (preceded by a descriptive key) is given of the symptoms, distribution, and control of fungous, bacterial, virus, and physiological diseases and injuries of the onion, which occur either in the field or in storage.

ROSELLA (E.). **La maladie du collet de la Laitue, ses causes et ses remèdes.** [The collar disease of Lettuce; its causes and its control.] —*Progr. agric. vitic.*, cvii, 21, pp. 496–497; 22, pp. 514–515; 23, pp. 537–539, 1937.

The cultivation of lettuce over the whole of the Mediterranean seaboard of France is stated to be greatly menaced by the prevalence there of the collar rot caused by *Sclerotinia libertiana* [*S. sclerotiorum*: *R.A.M.*, ix, p. 759; xvii, p. 290], although it is believed that *S. minor* [ibid., xvi, p. 652] may also be responsible for the condition during the colder season, namely December–January. In discussing control measures, stress is laid on the inadequacy of crop rotation, owing to the polyphagous nature of the fungus and its suspected saprophytic abilities, and also on the practical difficulties of soil disinfection with chemicals. Observations indicated that seedlings replanted from seed-beds are particularly susceptible to the rot, possibly owing to the fact that the stable manure used for the beds offers a favourable substratum for

the initial development of the fungus. The losses caused by the disease may be minimized by increasing the resistance of the plants by well-balanced manuring, and by avoiding stagnation of water between the rows after watering. A brief reference is made to a strain of 'Batavia blonde' lettuce developed by Labrousse, which is stated to be completely immune from the collar rot caused by *S. sclerotiorum*.

WEISE (R.). **Der Spargelrost und seine Bekämpfung.** [Asparagus rust and its control.]—*Kranke Pflanze*, xiv, 12, pp. 205–208, 1937.

A semi-popular account is given of the symptoms, life-history, and control of asparagus rust (*Puccinia asparagi*), a destructive outbreak of which occurred in Saxony [*R.A.M.*, xvi, p. 238] in the summer of 1937. Most of the information here presented has already been noticed from other sources, but mention may be made of potash deficiency as a possible contributory factor in rust development, and of the susceptibility to the disease, not only of the reputedly immune American varieties but also of the German commercial line, Geo, though the latter shows a slight degree of resistance in the Weinböhla district.

MOGHILEFF (L. M.) & RYAKHOVSKI (N. A.). Сорта Чечевицы, устойчивые к увяданию. [Varieties of Lentils resistant to wilt.]—*Pl. Prot., Leningr., 1937*, 14, pp. 110–111, 1937.

Wilt of lentils caused by the fungus *Botrytis cinerea* [*R.A.M.*, viii, p. 289] is of comparatively recent occurrence in the U.S.S.R., where it is particularly severe in fields where lentils are preceded by sugar-beet. In field-plot tests carried out in 1936 with 18 varieties of *Lens esculenta* subsp. *macrosperma*, the following varieties selected by the Belaya-Tzerkoff Station showed the greatest resistance to the disease: variety 012 showed 0·0 per cent. of infection, 016 6·7 per cent., 017 2·7 per cent., and 021 1·3 per cent. The earliest ripening variety was 016, and the highest yield was given by 03 (slightly susceptible, 5·3 per cent. infection) selected by the same station.

GALATCHYAN (P. M.). Этиология „зеленой пятнистости" Огурцов в условиях Ленинградской области как обоснование мер борьбы с нею. [The eticlogy of green spotting in Cucumbers under conditions in the Leningrad region as a basis for control measures.]—*Pl. Prot., Leningr., 1937*, 15, pp. 44–56, 1937. [English summary.]

A detailed description is given of the symptoms of green spotting of cucumber which affects both leaves and fruit of plants grown under glass in the Leningrad district; leaf infection, however, often occurs independently of fruit infection. Of the micro-organisms associated with the disease, *Bacterium lacrymans* [*R.A.M.*, xv, p. 553] was shown by experimental infections to be the primary parasite, whereas *Cladosporium herbarum*, of which eight different races were found, is merely a secondary invader. The author regards *C. cucumerinum* [ibid., xvii, p. 155] as synonymous with *C. herbarum* and *Scolecotrichum melophthorum* [ibid., vii, p. 6] as belonging to the genus *Cladosporium*. For plants grown under glass the minimum temperature for infection with *Bact. lacrymans* is 0° C., the optimum 23 to 28·5°, and the maximum 33·5 to 36·5°. Field experiments established that the disease can be transmitted

through the soil and plant debris, since crops raised on soil previously planted with cucumbers showed 30 per cent. or more infection, whereas on new soil there was no disease apparent. The disease is also believed to be transmitted by the seed.

PORTER (D. R.). **Breeding high-quality wilt-resistant Water-melons.**—*Bull. Calif. agric. Exp. Sta.* 614, 43 pp., 14 figs., 1 graph, 1937.

In breeding work [which is fully described, and the results of which are tabulated] against watermelon wilt (*Fusarium* [*bulbigenum* var.] *niveum*) [*R.A.M.*, xvi, p. 439; xvii, p. 290] in California the genes for resistance were found to be carried by the susceptible commercial varieties Klondike and Grey Monarch. Continued propagation of resistant stock of these varieties has resulted in strains resistant enough to produce profitable crops in severely infested soil. Hybrids of Klondike with Pride of Muscatine or Iowa King were of inferior market qualities to hybrids from crosses of Iowa Belle with Klondike. Klondike R 7, the new resistant variety released in February, 1937, representing the F_7 generation of cross 67 obtained in 1930 by crossing Iowa Belle with Klondike, differs from commercial Klondike in fruit type, skin sutures, skin colour, and reaction to wilt; it is recommended for any locality for which Klondike has been found suitable.

AUCHINLECK (G. G.). **Report on the Department of Agriculture, Gold Coast, for the year 1936–37.**—21 pp., 1937.

In the section of this report dealing with the work of the botanist [T. L. Williams] (pp. 13–14) it is stated that in further breeding experiments against cassava mosaic [*R.A.M.*, xvii, pp. 161, 297] resistant seedling types tested included four (C 50, C 32, C 192, and C 282 A) bred from known parents and two natural seedlings (M 11 and M 14). Of these, the first three were obtained by crossing Calabar Seedling 34 with Sareso Seedling 22, and the fourth by crossing Calabar Seedling 54 with Calabar-Red Seedling 14, while the remaining two originated from Calabar Seedling 34. The first four were thus second-generation seedlings from tested parents. The percentages of the seedlings that became infected (average of four stations) were 8·2, 18·4, 8·2, 12·2, 60·4, and 23·4 for C 50, C 32, C 192, C 282 A, M 11, and M 14, respectively; C 282 A gave the highest yield and was the most palatable. It is being retained, together with C 50, for further tests.

Medidas para combatir la enfermedad de las plantas de Chile, llamada marchitez. [Means of combating the disease of Chilli plants known as wilt.]—*Agricultura, Mexico*, i, 2, p. 40, 1 fig., 1937.

The following measures are advocated for the control of chilli [*Capsicum annuum*] wilt caused by *Fusarium annuum* [*R.A.M.*, xiv, p. 7] in Mexico: crop rotation for a minimum period of four years, use of seed from resistant varieties, and seed disinfection by ten minutes' immersion in a 3 in 1,000 formalin solution, covering with a sack for one hour, and drying for 24 hours before sowing.

RUDOLPH (B. A.) & SNYDER (W. C.). **Verticillium wilt of Pepper.**—*Plant Dis. Reptr*, xxi, 22, p. 404, 1937. [Mimeographed.]

Tissue platings from two sets of diseased chilli pepper (*Capsicum*

annuum) plants of the Anaheim and Mexican varieties in southern California in every case yielded a *Verticillium* apparently agreeing with *V. albo-atrum* [*R.A.M.*, ix, p. 677; xi, p. 745; xii, p. 117, and next abstract]. In the field the lower leaves of the affected plants dropped off, and the edges and tips of those that remained attached were burned or brown. When the healthy cortex was cut away, the vascular cylinder showed a marked brown discoloration. The field of Mexican chilli was in its fifth year of peppers and showed about 20 per cent. loss, while the Anaheim field was in its second consecutive year and showed about 1 per cent. loss. There appears to be no previous record of *Verticillium* wilt of chillies in the United States.

DUNLAP (A. A.). **Rust on Teosinte and wilt of Pepper in Connecticut.**—*Plant Dis. Reptr*, xxi, 23, p. 426, 1937. [Mimeographed.]

Puccinia sorghi [*P. maydis*] was found on *Euchlaena mexicana* [*R.A.M.*, xiii, p. 573] growing near affected maize in Connecticut. *Capsicum annuum* in a few widely separated fields in the same State developed a wilt, causing almost complete loss of crop, due to a species of *Verticillium* [see preceding abstract]; the Worldbeater and California Wonder varieties were affected on one farm, and an unknown variety in a different locality.

BAUDYŠ (E.). **Das plötzliche Absterben der Weinrebe.** [The sudden dying-off of the Vine.]—Reprinted from *Winzer, Brünn, 1937*, 7, 4 pp., 2 figs., 1937.

The author states that in Moravia, Czechoslovakia, sudden wilting and death (non-parasitic apoplexy) [*R.A.M.*, xiv, p. 347] of vinestocks has of recent years gradually become increasingly prevalent. Observations indicate that the chief factors inducing the condition are the progressive drying-up of the soil in the vineyards from year to year, and the excessive fluctuations between day and night temperatures that have occurred very frequently during winter and spring for several years in succession. Vineyards on soils containing excessive lime in the subsoil are particularly susceptible to the trouble, which may then be controlled by heavy applications of potassium and magnesium sulphates. On very acid soils, lime should not be applied alone but in a mixture with magnesium salts. Gypsum is also useful to correct excessive alkalinity of the soil.

BIRON (M.). **Les pulvérisations arsénicales contre le rabougrissement de la Vigne et contre divers parasites animaux et végétaux.** [Arsenical sprays for the control of Vine stunting and of various animal and plant parasites.]—*Rev. Vitic., Paris*, lxxxvii, 2268, pp. 458–461, 1937.

In this note the author states that recent experience has shown that two dormant sprayings of vines (immediately following pruning and just before the spring renewal of growth) with alkaline naptho-arsenite solutions [*R.A.M.*, xv, p. 555], besides affording excellent control of insect parasites of the vine, are also very effective in the control of certain fungal diseases such as 'esca' (*Stereum necator*) [ibid., xvi, p. 436], excoriosis (*Phoma flaccida*) [loc. cit.], and court-noué [ibid., xvii, p. 159].

GABOTTO (L.). **La campagna peronosporica di quest' anno.** [The *Peronospora* campaign during the current year.]—*Boll. Lab. sper. R. Oss. Fitopat., Torino*, xiv, 1–4, pp. 44–45, 1937.

The author states that in 1937 the vines in Monferrato were invaded by six distinct waves of infection with downy mildew [*Plasmopara viticola*], of which the last in the second half of August was the only one that caused serious damage to the grapes, especially where the latter had failed to receive applications of cupric dusts. The results of the season again showed that Bordeaux mixture containing at least 1 per cent. copper sulphate, in combination with careful dusting of the developing grape bunches with dusts containing 20 per cent. copper sulphate, was more effective in the control of the disease than all the other preparations tested.

DU PLESSIS (S. J.). **Studies on the physiology and parasitism of Botrytis cinerea Pers.**—*Ann. appl. Biol.*, xxiv, 4, pp. 733–746, 2 pl., 1937.

A tabulated account is given of the author's culture studies on two of the varieties (B 1*c* and B 12*c*) of *Botrytis cinerea* discussed by him in a previous communication [*R.A.M.*, xv, p. 701]. No definite conclusion could be drawn as to whether these two varieties prefer nitrogen in the ammonium or in the nitrate form; the greatest weight of mycelium was produced per unit weight of nitrogen consumed from a nitrate source, although growth on such media was somewhat poorer; the amount of acid produced was greater on media containing nitrogen as nitrates than on those supplying it as ammonium compounds. There was clear evidence that the changes in acidity induced by the organisms in the media, and also the total amount of acid produced, depend upon the variety of *B. cinerea*, the source of nitrogen supplied, and the initial hydrogen-ion concentration of the medium. In a special series of tests it was shown that the susceptibility of uninjured Henab Turki grapes to the B 12*c* variety increased with maturity, and that injured berries were slightly susceptible even when they were green. A fair amount of growth of this variety occurred in raw sterilized juice from the greenest grapes tested. The experiments clearly demonstrated the important protective part played by the cuticle and cell walls of the grapes against invasion by *B. cinerea*.

SALMON (E. S.) & WARE (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll., Wye*, xli, pp. 15–19, 1938.

This report [cf. *R.A.M.*, xvi, p. 366] contains the following items of interest. Five out of 33 Ulster Monarch potato plants in one row at Wye were infected by *Botrytis cinerea* at ground-level. Broccoli was severely attacked by *Cylindrosporium concentricum* [ibid., xv, p. 474], which occurred on the laminae and petioles, causing withering and scorching of the outer leaves. Tomatoes were affected by *Verticillium* wilt [*V. albo-atrum* or *V. dahliae*: ibid., xv, p. 690] and fruit rot (*Phoma destructiva*) [ibid., xvi, p. 419]. The leaves of Bramley's Seedling and Worcester Pearmain apples showed numerous angular spots 1 to 2 mm. in diameter, greyish-brown on the upper, and brown on the lower, surface of the lamina, associated with a *Phyllosticta*. *Plasmopara viticola* occurred on a vine. Cultivated mushrooms [*Psalliota* spp.] were affected

by *Verticillium malthousei* [ibid., xv, p. 775]. Watercress beds in Sussex were reported to have become almost bare in large patches; the affected plants showed the presence of a *Pythium* which W. R. I. Cook considers will probably prove to be *P. megalacanthum* [ibid., xiv, p. 362]. *Septoria drummondii* was found on the dying leaves of blue-flowered *Phlox drummondii* plants. Hops when picked were virtually free from *Pseudoperonospora humuli* [ibid., xvi, p. 366]; cottonseed oil-Bordeaux emulsion with added nicotine was satisfactory as a combined fungicide-insecticide [ibid., xvi, pp. 818, 835].

Seed testing and plant registration.—*Scot. J. Agric.*, xxi, 1, pp. 54–70, 1938.

The following items occur in this report. In further investigations into strawberry red core [*Phytophthora* sp. allied to *P. cinnamomi*: *R.A.M.*, xvi, p. 515] in Scotland, 18 seedlings from various crosses tested in infected land in 15 different localities under commercial conditions appeared to remain immune for a number of years, and are now under test for their commercial qualities. Five of the seedlings are stated to show high promise.

Raspberry spur blight (*Didymella applanata*) [ibid., xvi, pp. 152, 298] was very disastrous in Perthshire in July, 1937, the attack on fruiting spurs and laterals proving particularly harmful. Infection was strongly favoured by drought in early summer followed by wet weather late in June.

In studies on potato virus diseases analyses of diseased plants for virus content gave the following provisional findings. Faint mottling is caused by a mild strain of virus X and sometimes by virus A; mild mosaic is normally caused by virus X; border-line severe mosaic by A+X, but may be due to infection by severe strains of X, by Y alone, or Y+mild strains of X; and severe mosaic by Y alone or in combination with other viruses. Observations made in different districts of Scotland showed that severe mosaic may increase by 100 to 150 per cent. and leaf roll by 200 to 300 per cent. in one year. Faint mottle caused a reduction in yield of up to 25 per cent., mild mosaic 40 per cent., border-line severe mosaic up to 64 per cent., severe mosaic 84 per cent., and leaf roll up to 96 per cent. (in Golden Wonder).

When potato tubers were dipped in six different chemical solutions after lifting, the greatest reduction in subsequent dry rot (*Fusarium coeruleum*) [ibid., xvi, p. 514] was given by 1 per cent. commercial formalin and a 1·66 per cent. solution of an organic mercury compound. Wounding increased the incidence of the disease, but after December this effect was less marked. Bruising also increased dry rot, but the effect depended on the type of potato variety affected, and its maturity.

Voelkel (H.) & Klemm (M.). **Die wichtigsten Krankheiten und Schädigungen an Kulturpflanzen im Jahre 1937. (Beobachtungs- und Meldedienst der Biologischen Reichsanstalt.)** [The most important diseases and injuries of cultivated plants in the year 1937. (Observation and warning service of the Reich Biological Institute.)] —*Beil. NachrBl. dtsch. PflSchDienst*, xviii, 1, 28 pp., 3 graphs, 66 maps, 1938.

This valuable survey of the diseases and other injuries affecting cultivated plants in Germany during 1937 has been prepared on similar lines to those of previous years [*R.A.M.*, xvi, p. 367].

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1936.** [Annual report for 1936 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Annu. agric. Suisse*, li, 10, pp. 1045–1079, 4 figs., 2 graphs, 1937.

The following are among the phytopathological items occurring in this report [cf. *R.A.M.*, xvi, p. 152]. *Coniothyrium diplodiella* [ibid., xvii, p. 95] was observed on the wood of American vine varieties serving as stocks, the symptoms on which were similar to those described by Istvanffy from Hungary.

One application of the so-called 'blue' treatment (6 per cent. Bordeaux mixture) to dormant Canada Pippin, Gravenstein, and Franc-Roseau apple trees shortly before coming into leaf gave better results than five or six of lime-sulphur (2 per cent.) plus 0·2 per cent. viricuivre against scab [*Venturia inaequalis*], the incidence of which on the three varieties was 19·7, 10·6, and 14 per cent., respectively, and 39·9, 47·8, and 42·7 per cent., respectively, for the two schedules, compared with 97, 90, and 71·4 per cent., respectively, for the unsprayed controls.

Apple mildew (*Podosphaera*) [*leucotricha*] appears to be definitely on the increase in Swiss orchards, where fairly satisfactory control has been obtained by spraying with 2 per cent. lime-sulphur before flowering.

The elimination of *Didymella applanata* [see above, p. 374] from raspberry plantings presents great difficulties. The incidence of infection was reduced from 33 to 14 per cent. by the application of 2 per cent. Bordeaux mixture on 20th November, 1935, followed by 0·5 per cent. Bordeaux mixture plus novemol on 18th May and 17th and 27th June, 1936, and to 12 per cent. by 2 per cent. Bordeaux mixture followed by three treatments with copper dust on the same dates.

SMITH (F. E. V.). **Report of the Plant Pathologist.**—*Rep. Dep. Sci. & Agric. Jamaica, 1936*, pp. 47–55, 1937.

The land on which banana cultivation has been abandoned in Jamaica owing to Panama disease (*Fusarium oxysporum cubense*) amounted to 32,839 acres at the end of 1935, which confirms the earlier estimate [*R.A.M.*, xvi, p. 300]. Banana leaf spot disease due to *Cercospora musae* [ibid., xvii, p. 331] is reported to have caused more intense damage than in previous years. It has been identified in almost every parish of the island, but serious damage to the crop has occurred only on plants growing under conditions producing flushes of soft growth, as in the plains of St. Andrew, Western St. Catherine, and in Vere.

Bacterial bud rot of coco-nut has continued to cause serious losses in Montego Bay, Lucea area, where it is restricted to a coastal belt two or three miles deep.

Wastage in eggplant fruit after export, due to *Phomopsis vexans* [ibid., xvi, p. 296], was noticed in April, May, and June, 1936.

Spraying with shirlan has been tested as a measure of control against leaf mould of tomatoes [*Cladosporium fulvum*: ibid., xv, p. 74]. Two

plots of four-weeks-old Marglobe plants were sprayed with shirlan AG at a rate of 1½ and 1 oz. per gal., respectively, the third plot being left unsprayed. After eight applications at weekly intervals the proportion of yields per plot was 5, 3, and 2, respectively. A concentration of 1½ oz. per gal. appears to control the disease, but the cost of the treatment is excessive, since 180 gals. of spray per acre are required at each application.

SIMMONDS (J. H.). **Plant pathological investigations.**—*Rep. Dep. Agric. Qd, 1936–37*, pp. 82–84, 1937.

This report contains the following items of interest apart from those already noticed from other sources [*R.A.M.*, xvi, p. 155]. During the season under review leaf spot of tobacco (*Cercospora nicotianae*) [ibid., xvii, p. 212] was particularly prevalent. It was observed in many instances that crops produced from seedlings sprayed with colloidal copper showed less infection than those produced from seedlings treated with [benzol] vapour [loc. cit.]. It is suggested that the combined application of both methods during the wet periods may prove the most effective. A leaf spot of tobacco which caused some concern in south-western districts was attributed to *Phyllosticta nicotianae* and this diagnosis was confirmed by F. A. Wolf.

The efficacy of colloidal copper (1 gal. stock solution to 13 gals. water) in the control of brown spot of the Emperor mandarin [ibid., xvi, p. 451] was confirmed in a further spraying trial at Howard, conducted by F. W. Blackford. The average percentage of diseased fruit on trees sprayed in September, October, December, and late February was 3·1 compared with 31·1 in the controls. Trees sprayed in September, November, and late February yielded a slightly higher percentage of infection, but this shorter schedule is recommended as more practical.

Ascochyta caricae, *Gloeosporium* sp., and an undetermined fungus have been found causing the common ripe rot of papaw [cf. ibid., xv, p. 363]. The virus disease, yellow crinkle, was very prevalent in most districts in the early part of 1937 and caused considerable losses. An abnormal and rapid spread of the virus disease of passion fruit known as woodiness [ibid., xvi, p. 796] was observed during the year in spite of strict eradication and disinfection measures. Twig injections with zinc gave satisfactory results in preliminary investigations of the apple little leaf problem [ibid., xvi, p. 754].

J. E. C. Aberdeen records for the first time in Queensland the outbreak of bacterial canker (*Aplanobacter michiganense*) on tomato [ibid., xv, p. 280; xvii, p. 354].

On pp. 85–89 of the same annual report H. K. Lewcock sums up the results of pineapple investigations and states that on most Queensland soils iron deficiency resulting in serious metabolic disturbances and leading to dwarfing, susceptibility to disease, and chlorosis can be rectified by the use of sulphur. In the case of some soils, however, particularly highly buffered manganiferous soils, it is advisable for economic and other reasons to spray the foliage with a solution of sulphate of iron instead.

Division of Plant Pathology.—*Rep. N.Y. St. agric. Exp. Sta., 1936–37*, pp. 54–65, 1938.

This report of the Division of Plant Pathology (replacing the former Division of Botany) of the New York State Agricultural Experiment Station [cf. *R.A.M.*, xvi, p. 438] contains the following, among other, items of interest. The examination of 150 budded apple trees badly infected by crown gall [*Bacterium tumefaciens*: ibid., xvi, p. 191], set in 1934 and removed in 1936, showed that the condition of the top growth was approximately the same in all cases and did not reflect that of the roots. Fresh galls had formed on new roots during the three years the trees were in the ground, and the root system in many cases was very poor. The original galls were still present on a number of the trees, while others had decayed and permitted the entry of secondary organisms to the roots or trunk. It is concluded that either grafted or budded trees infected by crown gall should be placed in the cull class and discarded for planting purposes.

The Marcy and Indian Summer red raspberry varieties, originated by the Station, have remained absolutely free from mosaic infection following extremely severe intentional exposure to natural virus spread for four seasons in the Hudson Valley and for three in western New York, while several other unnamed seedlings of identical or similar parentage also escaped the disease completely in the trial plantings.

'June yellows' [see below, p. 402] of strawberries appears to be a variegation of genetic origin rather than an infectious virus disease. Certain stocks of the widely grown and highly susceptible Premier variety have remained free from the disorder even in close proximity to affected strains, and their use for planting material is recommended as an effective control measure.

Fusarium wilt of cantaloupes [ibid., xvii, p. 154] was experimentally shown to be transmissible by means of the seed from infected fruit.

Both yellow oxide of mercury and calomel [mercurous chloride], incorporated with the fertilizer mixture at the rate of 2, 4, or 6 lb. per acre, reduced the incidence of potato scab [*Actinomyces scabies*: ibid., xvii, pp. 199, 268], the intermediate quantity generally giving the best results. On certain soils, however, with a reaction of P_H 5·6 or above, infestation may be so severe as to preclude commercial control by this treatment.

A serious disease of hops, known as 'slip-down' and first recognized in 1935 but probably of at least 30 years' standing, is believed to be due to a virus. Affected plants seldom climb far up the poles and commonly slip down; in severe cases few or no cones are produced.

Notes are also given (on pp. 91–95) on fungi occurring on seed samples and on the effect of disinfectants on germination.

Report of progress for year ending June 30, 1937.—*Bull. Me agric. Exp. Sta.* 387, pp. 157–262, 6 figs., 4 graphs, 1937.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xv, p. 483]. A blend of Bordeaux mixture and linseed oil was found by M. T. Hilborn to be the most effective wound dressing for the protection of winter-injured apple trees [ibid., xvii, p. 327],

acting as a satisfactory disinfectant and adhering to the treated surface for two to three years.

In an experiment conducted by R. Bonde and L. A. Schaal, Irish Cobbler potato tubers selected for freedom from *Rhizoctonia* [*Corticium solani*] and treated with mercuric chloride yielded 175±2·43 barrels per acre compared with 171±3·06 from similarly treated, unselected seed, the comparable figures for sanoseed being 176±2·93 and 165±3·51, and for the untreated controls 179±3·71 and 149±3·18, respectively.

One of the most severe late blight [*Phytophthora infestans*: ibid., xvii, p. 267] epidemics in the history of Aroostook County occurred during the late and excessively wet season of 1936, and immense losses were obviated, according to R. Bonde, by a very intensive spraying programme. A comparison of different spraying schedules showed that the earlier applications could be omitted with safety provided that the best modern spraying equipment was used, and that basic copper sulphate was almost as efficient as Bordeaux mixture, but that copper-lime dusts compared unfavourably. During the climax of the disease in August, the foliage of Green Mountain was rapidly destroyed, and fully 50 per cent. of the tubers of this variety were found to be decayed, whereas those of a new seedling, # 44488, remained sound and the leaves were little affected. The yield of # 44488 amounted to 119±3·33 barrels per acre compared with only 67±5·22 from Green Mountain.

G. W. Simpson succeeded in one locality in raising Green Mountain potatoes for seed purposes entirely free from mild mosaic and leaf roll throughout the growing season (the fifth since the importation from Canada of the seed in question). Three factors are believed to be involved in the absence of disease from the plot in question, viz., its isolated position, offering little or no risk of extraneous infection; continuous roguing from the time the plants reached a height of 6 in. until maturity; and timely harvesting of sufficient seed for planting the following season. Little success is to be expected in inadequately isolated plots.

Botany.—*Rep. Pa agric. Exp. Sta., 1936–37* (*Bull.* 352), pp. 38–41, 1 fig., 1937.

In this report [cf. *R.A.M.*, xv, p. 138] J. W. Sinden states that many mushroom-growers use synthetic compost [ibid., xvi, p. 793; xvii, p. 11] mixed with an equal quantity of well-composted horse manure. Experiments showed that this did not reduce the crop, and mixture with one-quarter of horse manure reduced it only slightly. The addition of phosphorus in the form of bone meal or superphosphate had no effect on the yield, but under certain circumstances the addition of brewers' grains improved the compost. Single spore strains of mushrooms [*Psalliota* spp.] were found to vary widely in yield and quality, one-third of them yielding no crop at all. One strain seemed promising, but showed susceptibility to the 'open veil' symptom under dry conditions.

According to W. S. Beach the following injurious fungi in mushroom manure were killed at a fermentation temperature of 115° to 120° F.: *Mycogone perniciosa* [ibid., xvi, p. 653], *Verticillium* sp., *Dactylium* sp., *Monilia* [*Oospora*] *fimicola* [ibid., xvii, p. 92], *Trichoderma* spp., and *Bacterium* [*Pseudomonas*] *tolaasi* [ibid., xvii, p. 13]. *Myriococcum*

praecox [ibid., xvi, p. 653] was killed at 129° F. and *Chaetomium olivaceum* [ibid., xiv, p. 345] at 140°, while *Pseudobalsamia microspora* [ibid., xv, p. 138; xvii, p. 93] survived temperatures over 140°. The prevalence of *O. fimicola* depends on alkalinity after composting, but prolonged fermentation at 130° to 140° should enable the spawn to compete successfully with all moulds.

E. L. Nixon reports that further experiments confirm the resistance of the Richard Peters pear to fireblight [*Erwinia amylovora*: ibid., xv, p. 138; xvii, p. 48]. Crosses of Bosc on Richard Peters, which are now coming into bearing, seem to be equally resistant, and should be of better quality.

In control of tobacco wildfire [*Bacterium tabacum*: ibid., xv, p. 138; xvii, p. 354] the previously recommended measures have been found effective in field trials on 24 farms.

A year's progress in solving farm problems of Illinois.—*Rep. Ill. agric. Exp. Sta., 1935–36*, 333 pp., 34 figs., 1 diag., 15 graphs, 2 maps, 1937.

This report [cf. *R.A.M.*, xiii, p. 217] contains the following items of interest. According to B. Koehler and H. H. McKinney wheat mosaic [*R.A.M.*, x, p. 647], attacking winter varieties, is now known to cause more damage in Illinois than in any other part of the world. Under conditions favourable to the disease, crop losses amount to 80 per cent. Bald Rock, Fulcaster, Fulhio, Nabob, Shepherd, Trumbull, and Wabash are highly resistant varieties but none of them is satisfactory in all other desirable characters.

In the course of a comparative study on the control of loose and covered smuts of oats [*Ustilago avenae* and *U. kolleri*] directed by B. Koehler, seed grain of Iowar oats, the controls of which produced 6·3 per cent. smutty heads, was treated with ceresan at the rates of $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ oz. per bush. 67 days, 23 days, 1 day, and 10 minutes before sowing. The $\frac{1}{2}$ oz. treatment controlled the infection in all cases, the $\frac{1}{4}$ oz. treatment resulted in 0, 0, 0·42, and 0·49 per cent. smut, respectively, for the different periods of storage, and $\frac{1}{8}$ oz. gave 0·04, 0·25, 1·17, and 1·54 per cent. smut. Seed treatment with formalin at the rate of 1 pint to 50 bush. 67 and 23 days and 1 day before sowing resulted in 0, 0, and 0·08 per cent. smut, respectively; the corresponding percentages for 1 pint to 100 bush. being 0·08, 0·25, and 1·54, and for 1 pint to 150 bush., 1·13, 1·69, and 2·92.

Experiments carried out by H. W. Anderson proved that no parasitic fungus or bacterium can be held responsible for apple measles [see below, p. 400], a disease causing in some orchards a loss of 10 per cent. of the potential crop. It appears to be restricted to a few varieties, of which Red Delicious and its sports are the most susceptible. Grafting and budding experiments have so far failed to establish a virus origin of the disease.

Experiments conducted by S. C. Chandler to determine the minimum concentration of copper sulphate for effective spray control of peach leaf curl [*Taphrina deformans*: ibid., xvii, p. 255] indicate that it is unsafe to use less than 6 lb. of copper sulphate to 100 gals. of the spray. Trees sprayed with Bordeaux 8–8–100 and 6–6–100 showed 1

per cent. leaf curl, while trees sprayed with 4–4–100 showed 6 per cent., as compared with 24·5 per cent. in the controls.

H. W. Anderson and A. S. Colby have found three varieties of strawberries resistant to 'brown stele' disease [cf. below, p. 401], namely, Aberdeen (which is especially suited to conditions in Edgar county), Red Heart, and Mastodon.

The best results in controlling a stem rot disease of *Euphorbia fulgens*, caused by *Fusarium* sp., were obtained by F. F. Weinard and S. W. Hall by transferring cuttings directly into sterilized potting soil and then into steam-sterilized bench soil.

Vinogradova (Mme O. S.) & Pershina-Mansireva (Mme S. G.). **Prophylactic action of the bacteriophage on the formation of the crown gall induced by B. tumefaciens.**—*Bull. Biol. Méd. exp. U.R.S.S.*, iv, 3, pp. 275–278, 2 figs., 1 graph, 1937.

Details are given of experiments conducted at the Moscow (U.S.S.R.) Microbiological Institute in 1935–6 on the preventive action of the bacteriophage of *B*[*acterium*] *tumefaciens* [*R.A.M.*, xvi, p. 369] on crown gall formation in beet [ibid., xvii, p. 285] and carrot plants, of which 1,107 were used during the two years' tests. On attaining a height of 6 to 10 cm., the seedlings were uprooted, rinsed with water, and immersed for 24 hours in a filtered solution of the bacteriophage. Inoculation was effected either by two hours' immersion of the roots in a suspension of the crown gall organism or through punctures. In another series of tests treatment with the bacteriophage followed immersion of the shoots in the bacterial suspension.

With a few exceptions, the bacteriophage treatment caused a marked decrease in the percentage of infected plants. To cite a few instances, in tests 3 and 4 (1935), the treatment produced 62 per cent. of healthy beet plants compared with 23 per cent. in the control series, while in 7 and 8, 59 per cent. of the treated carrot plants were healthy as against only 27 per cent. of the controls. In tests 7 and 8 of 1936 there were 82 per cent. sound carrots in the treated series compared with 10 per cent. in the controls.

Sprague (R.). **Additions to the check list of the parasitic fungi on cereals and other grasses in Oregon (1935–37).**—*Plant Dis. Reptr*, xxi, 23, pp. 412–422, 1937. [Mimeographed.]

This further list of cereal and other grass pathogens found in Oregon is a continuation of the list published in 1935 [*R.A.M.*, xiv, p. 744].

Sprague (R.). **Gill fungi associated with the roots of cereals.**—*Phytopathology*, xxviii, 1, pp. 78–79, 1 fig., 1938.

Pholiota dura, *P. praecox*, *Naucoria* spp., and a number of small, delicate, undetermined Agaricales have been found associated with oats, barley, and wheat crowns in western Oregon. The white, rhizomorphous mycelium of these fungi causes shredding and decay of necrotic and dead leaf sheaths and sometimes even appears to enter the outer cortical root cells. The introduction into greenhouse soil from 1930 to 1933 of a Basidiomycetous mycelium isolated in pure culture from wheat

and barley plants, far from adversely affecting the wheat, oats, barley, rye, and einkorn plants growing therein, actually stimulated their development. In 1934 similar inoculations were carried out with *P. dura*, which also exerted a mildly beneficial effect on the plants.

Barmenkoff (A. S.) & Pantchenko (N. P.). Микрокамера для оценки зерновых культур на устойчивость к ржавчине и проверка ее на селекционном материале. [A micro-chamber for testing the resistance of cereals to rust and for checking the reaction of breeding material.]—*Pl. Prot., Leningr., 1937*, 14, pp. 73–79, 1937.

Further details are given of the micro-chamber constructed by the first-named author for testing the varietal resistance of wheat to different races of *Puccinia triticina* [*R.A.M.*, xv, p. 636]. The apparatus, which should preferably be made of acetyl-cellulose, has been extensively tested with most satisfactory results.

Stakman (E. C.) & Cassell (R. C.). **The increase and importance of race 56 of Puccinia graminis tritici.**—Abs. in *Phytopathology*, xxviii, 1, p. 20, 1938.

Attention is drawn to the remarkable extension in geographical distribution and increase in prevalence of race 56 of *Puccinia graminis tritici* [*R.A.M.*, xiv, p. 350]. First observed in 1928, only in Iowa, Kansas, and Nebraska, it is now generally distributed on wheat throughout the United States, northern Mexico, and Canada (according to Dominion Rust Research Laboratory reports). From 1928 to 1931, inclusive, race 56 constituted 1 per cent. or less of the uredinial isolates identified by the writers in the United States: since then the following percentages have been recorded: 1932, 2·1; 1933, 3·7; 1934, 33·1; 1935, 44; 1936, 47; and 1937 (to 1st November), 56. Evidence is forthcoming that race 56 originated on barberry and was largely responsible for the collapse of Ceres wheat, which was moderately to highly resistant to stem [black] rust before 1935. In 1937, race 56 constituted some 70 per cent. of the Ceres isolates. The continued importance of the aecidial stage in the origin and persistence of races is shown by the fact that, from 1935 to 1937, inclusive, a different race was identified in every 6·5 aecidial isolates, the corresponding ratio for the uredinial stage being 1 : 59.

Vogel (O. A.) & Holton (C. S.). **Reaction of F_3 progenies of an Oro×Turkey-Florence cross to two physiologic races of Tilletia tritici and one of T. levis.**—*J. Amer. Soc. Agron.*, xxx, 1, pp. 55–59, 1938.

The reaction of the F_3 progenies of the cross Oro×Turkey-Florence wheat to two races of *Tilletia tritici* [*T. caries*] and one of *T. levis* [*T. foetens*: *R.A.M.*, xvii, p. 164] was studied at the Washington (State) Agricultural Experiment Station in 1936, and the results are fully tabulated and briefly discussed. Oro is susceptible to *T. foetens* race L-8, Turkey-Florence to *T. caries* T-11, and both slightly so to *T. caries* T-8.

The factors for resistance to all three bunt races have apparently been combined in some progenies and those for susceptibility in others.

Less than 5 per cent. infection occurred in 8 out of 190 F_3 offspring following inoculation with L-8, in 33 out of 188 inoculated with T-11, and in 33 out of 168 inoculated with T-8, while 4 out of 168 F_3 families averaged less than 5 per cent. for the three races. Selections from progeny 1098 continued to show high resistance in the F_4, and in 1937 further selections from these remained free from infection by 18 individual races of bunt and produced 3 to 23 per cent. partially bunted heads in response to infection by L-8.

Radulescu (E.). **Uebt die Weizensorte eine selektive Wirkung auf Tilletia-Arten aus?** [Does the Wheat variety exert a selective action on *Tilletia* spp.?]—*Z. PflKrankh.*, xlviii, 1, pp. 39–42, 1 diag., 1938.

Preliminary experiments were undertaken from 1933 to 1936 at the Cluj (Rumania) Plant Breeding Station to determine the possible influence of the particular wheat varieties at present under cultivation on the distribution of *Tilletia tritici* [*T. caries*] and *T. foetens*, of which the former, once comparatively sparsely represented in south-eastern Europe, has lately been shown to predominate in the north and west of the country [*R.A.M.*, xiv, p. 502]. Six varieties (Cenad 117, Minturki C.J. 6155, Hâtif inversable, Turkey C.J. 1558, Strube's Dickkopf, and Berkeley Rock) were inoculated with five separate mixtures, in varying proportions, of the two smuts. During the period covered by the tests, the ratio of *T. caries* to *T. foetens* increased rapidly from year to year on five of the varieties; for instance, in mixture 3 (52·7 per cent. of the former and 47·3 per cent. of the latter) on Berkeley Rock, *T. caries* alone was detected in 1935, the same stage being reached by Cenad 117 and Minturki a year later, when Turkey was the only variety to show a slight admixture of infection by *T. foetens* (4·5 per cent.). Hâtif inversable constituted an exception to the rule, raising and lowering the ratio of *T. caries* to *T. foetens* in the different mixtures so as to equalize the proportions of the two smuts.

Skvortzoff (S. S.). Простой метод обнаружения гиф пыльной головни в зерне Пшеницы. [A simple method for detecting hyphae of loose smut in Wheat grains.]—*Pl. Prot., Leningr., 1937*, 15, pp. 90–91, 1937.

The author devised the following method for the detection of mycelium of *Ustilago tritici* in wheat grains. The embryos are separated from the grains, macerated in sodium hydroxide, stained with aniline blue, and examined under the microscope, where the hyphae appear distinctly blue among the almost colourless cells of the embryo.

Petit (A.). **Traitements rapides des semences de Blé tendre contre le charbon interne (Ustilago tritici).** [Rapid treatments of soft Wheat seed-grain against loose smut (*Ustilago tritici*).]—*Bull. Direct. Aff. écon., Tunis*, 2, 22 pp., 1 graph, 1937.

In this paper the author discusses the technical and theoretical aspects of the control of loose smut (*Ustilago tritici*) of wheat in Tunis by the single and double bath hot-water treatments, the practical

information relating to which has already been noticed from another source [*R.A.M.*, xvii, p. 21].

Luthra (J. C.), Sattar (A.), & Ghani (M. A.). **Perpetuation and control of Septoria disease of Wheat in the Punjab.**—*Agric. Live-Stk India*, viii, 1, pp. 17–25, 1938.

A study [the results of which are tabulated] on the manner of perpetuation, spread, and control of *Septoria tritici*, which causes a serious disease of wheat in the Punjab [*R.A.M.*, xvi, p. 733], showed that the pycnospores remain viable in the pycnidia borne on straw used for making 'bhusa' stacks [consisting of wheat straw broken into small pieces] and on diseased leaves left lying on the ground, as well as on diseased straw used in enclosing the stacks, and produce infection in the summer in the subsequent wheat crop. The fungus was found not to survive on infected debris buried in the soil at a depth of 1½ in. or more. Control consists in suppressing these sources of infection, and should include the careful weeding of the edges of the fields. Field and pot inoculation tests with all the available types of wheat grown in the Punjab showed that the *Triticum durum* types are almost immune, while *T. compactum* and *T. vulgare* are susceptible.

Vik (K.). **Melduggresistens hos Vårhvete.** [Mildew resistance in spring Wheat.]—*Meld. Norg. LandbrHøisk.*, xvii, 7, pp. 435–495, 1937.

During the last 20 years spring wheat at the experimental farm of the Royal Agricultural College of Norway has been repeatedly attacked by mildew (*Erysiphe graminis tritici*) [*R.A.M.*, xvi, p. 801], which has also occurred in other parts of the country, sometimes in epidemic form, and is believed to have caused a heavier reduction in yield than any other fungal disease of the crop. All the commonly cultivated spring and winter wheat varieties have proved more or less susceptible to mildew, but a high degree of resistance has been shown by a single pure line isolated from an indigenous 'land' variety in 1919 (JO3) and an unnamed, late-ripening Japanese variety. Neither of these being suitable for extended cultivation, they have been kept for breeding purposes and used as one of the parents in some 50 crosses made with a view to combining mildew resistance with other desirable agricultural and commercial qualities.

In the F_1 generation resistance proved to be incompletely dominant, and in later generations segregation occurred in a variable manner, possibly owing to the presence of genetic factors for miscellaneous plant characters modifying the expression of the main resistance factor. The mean yield depression in twelve series of progeny from crosses between resistant and susceptible varieties was found to be 7·7 per cent. for grain and 7·2 per cent. for straw per unit of degree of attack according to a scale ranging from 0 (no infection) to 10 (leaves almost covered with mildew). Susceptible varieties often being infected to the degrees of 4 to 6 or above, the yield reduction may amount to 30 or 40 per cent. Many of the resistant lines obtained by hybridization have been tested on the experimental farm and found to outyield not only the susceptible varieties, but also their own resistant parents. The mean grain yields of two of these lines, O76–13 and O76–63, derived from a cross between

JO3 and Mo07 (a non-resistant compactum type) are 26 and 21 per cent., respectively, above that of the most prolific susceptible variety, Ås. Similar results have been obtained in numerous trials on farms in the south-east of Norway. Line O76–13 is now available for distribution under the name of Fram.

GORLENKO (M. V.). **Resistance of winter Wheats to black bacteriosis (Bacterium translucens var. undulosum S.J.R.).**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xviii, 2, pp. 97–99, 1938.

In this paper data are given on the susceptibility of winter wheat races to black bacteriosis (black chaff), due to *Bacterium translucens* var. *undulosum* [*R.A.M.*, xvi, p. 243], a disease which generally affects the ears, leaves, and stalks, but in the U.S.S.R. is chiefly concentrated in the ears.

Field observations on 318 varieties of winter wheats grown on plots at the Kamenno-Stepnaya experiment station yielded the following results. The races *alborubrum*, *milturum*, and *ferrugineum* were very susceptible, the races *erythrospermum* and *lutescens* occupied an intermediate position, and the races *velutinum*, *hostianum*, *nigro-aristatum*, *barbarossa*, and *albidum* were resistant to the disease. The fact that red-eared races were more severely attacked seems to indicate that the chemical composition of their sap or of the pigment itself may exert some influence on the organism.

BRIGGS (F. N.). **The inheritance of resistance to mildew.**—*Amer. Nat.*, lxxii, 738, pp. 34–41, 1 graph, 1938.

A study was made at the California College of Agriculture from 1935 to 1937 of the inheritance of resistance to form 3 of barley mildew (*Erysiphe graminis hordei*) [*R.A.M.*, xvii, p. 307] in hybrids between the resistant varieties Arlington Awnless, Chinerme (C.I. 1079, Black Awnless, from Chungking, China), and Nigrate (a selection of Chinerme), and the susceptible Atlas, Hanna, and Goldfoil. The three resistant varieties were found to differ from the susceptible Atlas in the possession of two independent major factors for mildew resistance. Susceptibility to mildew was recessive in the F_1 and F_2 generations.

Crosses of the three resistant varieties with Hanna and Goldfoil resulted in the segregation of susceptible lines, indicating that the factor common to the two susceptible races is not carried by Arlington Awnless, Chinerme, and Nigrate.

Crosses of Chinerme and Nigrate with Arlington Awnless, and of Nigrate with Chinerme, produced no susceptible plants, showing that these varieties have at least one factor in common for mildew resistance.

HO (W. C.) & MELHUS (I. E.). **Pythium graminicolum on Barley in Iowa.**—Abs. in *Phytopathology*, xxviii, 1, p. 9, 1938.

Pythium graminicolum [*R.A.M.*, xvi, pp. 174, 562] was isolated in May 1936 from the roots of stunted, yellow, sometimes flaccid and dying barley plants in central Iowa, and shown to be the causal organism of the disease. Cross-inoculation experiments demonstrated the active parasitism of the fungus on timothy [*Phleum pratense*], millet [? *Panicum miliaceum*], wheat, rye, and maize, oats and sorghum

being much more resistant. *Pythium graminicolum* grew better in steamed alkaline than in acid soil (P_H 4 to 11). The hyphae were observed to penetrate the root tips in the zone just behind the cap, moving inter- and intracellularly. Reproductive organs developed profusely in the parenchymatous tissue and vascular bundles of the young infected roots. Seedlings grown in association with the pathogen in glass cylinders partly filled with steamed soil developed extensive root necrosis and aerial stunting.

Van Itallie (T. B.). **Magnesiummangel und Ionenverhältnisse in Getreidepflanzen.** [Magnesium deficiency and ionic ratios in cereal plants.]—*Bodenk. u. PflErnähr.*, N.F., v, 5–6, pp. 303–334, 3 graphs, 1937.

A comprehensive, tabulated account is given of the writer's theoretical and practical studies at the State Agricultural Experiment Station, Groningen, Holland, on the etiology and control of the Hooghalen or magnesium deficiency ['soil acidity'] disease of oats and other cereals [*R.A.M.*, ix, p. 16; xv, p. 461; and next abstract]. The symptoms were most conspicuous in soils of low base saturation and hydrogen-ion concentration. The magnesium content of the plants was low in limed soils, higher in soils receiving magnesium, and reached a maximum when calcium oxide and magnesium were applied simultaneously. The beneficial effect of calcium oxide was found not to be related to the hydrogen-ion content of the soil. The differences between the magnesium contents of normal plants and those showing deficiency symptoms were frequently small. When calcium oxide plus magnesium was applied to magnesium-deficient soils, the amount of magnesium necessary to correct deficiency symptoms in plants diminished with increased dressings of calcium oxide. On soils with a low hydrogen-ion concentration receiving ammonium sulphate, neither liming nor magnesium treatment completely eliminated deficiency symptoms or produced maximum yields. Mottling due to magnesium deficiency was more marked under the influence of ammonium sulphate than of sodium nitrate. The application of potash fertilizers to the soil decreased the calcium and magnesium contents of the plants and accentuated deficiency symptoms. The simultaneous application of potash and magnesium, however, produced the reverse effect. The intake of magnesium by the plants was found to depend both on the absolute supply of the element and on the ratio of the magnesium ion to others present.

Stieltjes (D.). **Enige waarnemingen over de Hooghalensche ziekte en de ontginningsziekte op het mineralenproefveld op de 'De Eese' bij Steenwijk.** [Some observations on the Hooghalen and reclamation diseases on the mineral experimental field at De Eese near Steenwijk.]—*Landbouwk. Tijdschr., Wageningen*, xlix, 605, pp. 844–853, 1937. [English summary.]

The preference of Dutch farmers for the old-fashioned brands of kainit over the modern potash fertilizers now on the market is attributed by the writer, on the grounds of his observations and experiments near Steenwijk, to the magnesium content of the former which counteracts the tendency to the so-called Hooghalen or 'acidity' disease in

oats and other crops [see preceding abstract]. In a trial field on reclaimed land (P_H 4·2) on which white oats were the first crop to be cultivated, magnesium sulphate was the only one of various compounds used giving complete protection against this disorder, characterized by 'tigering' and distortion of the leaves and stunting of growth. A low hydrogen-ion concentration does not by itself induce such abnormalities, but it tends to disturb the magnesium metabolism of the plants, and the assimilation of the mineral is further impeded by the incorporation of lime with the soil. On the reclaimed land in the experimental field the condition is probably controllable by applications of magnesium sulphate at the rate of 80 kg. per hect.

Reclamation disease of oats [ibid., xvii, p. 236 and next abstract], characterized by a white, papery texture of the leaf tips, and by loose, white glumes, may develop long before the symptoms are usually recognized, namely, when the plant has produced only two or three leaves, which turn reddish-brown to greyish-white and finally shrivel. Other features of this disorder, the result of copper deficiency and remediable by the application of copper sulphate (100 kg. per hect.), include under-development, brown discoloration, and unravelling of the glumes, usually ascribed to *Thrips* and *Chlorops* infestation.

ARND (T.) & HOFFMANN (W.). **Spurenelemente und ihre Wirkung auf das Pflanzenwachstum unter besonderer Berücksichtigung von Versuchsergebnissen mit Kupfer.** [Trace elements and their effect on plant growth with particular reference to experimental results with copper].—*J. Landw.*, cxxix, 1–2, pp. 71–99, 1 fig., 1 graph, 1937.

In addition to a comprehensive review of the literature dealing with the role of various accessory elements in maintaining the health of agricultural crops, the writers describe, tabulate, and discuss the results of pot experiments at the Prussian Moorland Experiment Station, Bremen, in which the reclamation disease of Lischow oats [see preceding abstract] was successfully combated by the incorporation with the sandy heath soil of copper sulphate at the rate of 0·5 mg. per l. water. Even in soils with a plentiful moisture content the disorder developed among plants receiving water twice distilled over glass and virtually devoid of copper, whereas the copper content of ordinary distilled water (about 70 γ per l.) sufficed to prevent reclamation disease and that of tap water (40 γ) to reduce its severity. These data, taken in conjunction with the fact that the trouble may be remedied by painting the leaves with copper sulphate, are considered definitely to point to a deficiency of available or active copper in the soil as the cause of reclamation disease.

The paper concludes with a brief theoretical discussion of future possibilities in the use of other representatives of the 92 elements of the periodic system in the service of agriculture.

STOREY (H. H.). **Investigations of the mechanism of the transmission of plant viruses by insect vectors. II.**—Abs. in *Proc. roy. Soc.*, Ser. B., cxxv, 838, pp. 25–26, 1938.

Continuing his investigations into the mechanism of the insect transmission of plant viruses [*R.A.M.*, xii, p. 686; xvii, p. 160] the author

found that individual insects of *Cicadulina mbila*, all of which were capable of acting as vectors of maize streak, varied greatly in their ability to cause infection during a short period of contact with the plant. The results obtained by comparing the infections brought about by the insects singly and in groups appeared to conform with the hypothesis that the effect of one insect is independent of those of any other insects that may cause punctures. If this is so, the plants used showed definite variation in susceptibility.

When the portion of leaf exposed to the insect was removed after contact, the probability of infection was reduced, and it was concluded that the virus had normally become established in the plant and had moved down a distance of some millimetres during contact.

While resting on a maize leaf *C. mbila* always has its mouth-parts inserted, though it may change its position and may suck intermittently. The stylets penetrate all the tissues, but are moved frequently until the phloem is entered. The insect can take up virus from the chlorotic part of a diseased leaf during a puncture lasting only 15 seconds and not passing beyond the mesophyll. Punctures confined to the green parts between the chlorotic areas fail to take up any virus, whether they extend to the mesophyll or the phloem. A single puncture can cause infection. The traces of all single infective punctures examined entered the phloem, those of unsuccessful punctures sometimes entering the phloem, and occasionally finishing elsewhere. Successful transmission took place through a wax membrane into a leaf below it providing it was not thick enough to prevent the stylets from reaching the phloem. Seedlings were not infected by insects feeding on the coleoptile, in which the phloem is beyond the reach of the stylets.

No plants became infected by any number of punctures if they were all of less than about 5 minutes' duration at temperatures ranging from 23° to 26° C. Many punctures of less duration reached the phloem.

The hypothesis is advanced that inoculation occurs in distinct doses, each independent in its effect of other doses inoculated by the same or other insects. The delivery of a dose is determined by some incident occurring only after the puncture has been maintained for some time.

Perlet (J.). **Zur Bekämpfung des Mais-Beulenbrandes.** [On the control of Maize smut.]—*Dtsch. landw. Pr.*, lxv, 1, pp. 7–8; 2, p. 16, 1938.

Some practical suggestions are made for the control of maize smut [*Ustilago zeae*: *R.A.M.*, xvii, p. 237] in Czechoslovakia. Beginning at the end of June or early in July, the fields should be regularly inspected once a week and diseased plants removed, preferably by cutting, and burnt, the soil round the base being treated with 4 to 5 per cent. copper sulphate to destroy any fallen spores. At least six or eight years should be allowed to elapse between one maize crop and the next. Many farmers are of the opinion that smutted maize may safely be fed to livestock after silage, but this view is not shared by the writer. According to recent experiments, 36·81 per cent. of the spores were still viable after thorough silage, a larger number, in fact, than were found capable of germination (21·15 per cent.) in incompletely fermented maize, which contains a high proportion of butyric acid. It is therefore

concluded that diseased fodder is not only unwholesome, but that its consumption may well entail the perpetuation and extension of the disease.

WELLHAUSEN (E. J.). **Genetics of resistance to bacterial wilt in Maize.** —*Res. Bull. Ia agric. Exp. Sta.* 224, 114 pp., 7 figs., 42 graphs, 1937.

In studies [which are fully described] made to determine the mode of inheritance in maize of resistance to bacterial wilt (*Phytomonas* [*Aplanobacter*] *stewarti*) [*R.A.M.*, xvii, p. 238], particularly in the later generation progenies of two crosses of OSF, a very resistant inbred dent maize, with WF, a very susceptible inbred flint maize, and with W-134, a very susceptible inbred early yellow sweet maize, resistance was found to be almost completely dominant in the F_1 generation. The back-cross progeny ($F_1 \times$ susceptible) of both crosses fell into four equal groups, very resistant, moderately resistant, susceptible, and very susceptible. These differences were attributed to the independent segregation of supplementary factors for resistance: Sw_1 and Sw_2, which are completely dominant over their recessive alleles, sw_1 and sw_2, respectively.

In certain back-cross tests under different environmental conditions each group could be subdivided into two further groups, one slightly more resistant than the other, indicating the presence of a third, minor supplementary factor Sw_3. According to the data, this factor, when alone, produces a degree of resistance only slightly higher than that shown by the triple recessive types, and when in combination with Sw_1, Sw_2, or both, modifies their expression by slightly increasing resistance. The results of F_2 tests and tests of F_3 and back-cross families confirmed this factorial hypothesis.

It was demonstrated that the parental combinations red cob colour and resistance, and white cob colour and susceptibility were more frequent in the back-cross and F_2 progeny than the non-parental combinations, indicating that one of the factors for resistance is genetically linked with the P-gene for cob colour; but the frequency of the non-parental types in the later generations indicates that the linkage is not very close.

The parental combinations late maturity and resistance, and early maturity and susceptibility tended to remain together in the later generation progenies. Endosperm characters appeared to segregate independently of resistance.

WEIMER (J. L.), BURTON (G. W.), & HIGGINS (B. B.). **Ascochyta sorghina Sacc. on Sudan Grass, Johnson Grass, and Sorghums in Georgia.**—*Plant Dis. Reptr*, xxi, 21, p. 378, 1937. [Mimeographed.]

Ascochyta sorghina [*R.A.M.*, xvii, p. 105] was observed in Georgia in 1936 on Leoti sorghum and Sudan grass [*Sorghum sudanense*], and in 1937 on Grohoma and Shallu grain sorghums, Goose-neck sorghum, Sudan grass, and Sudan $\times$ Leoti sorghum hybrids. The disease was also found in the same state on Early Amber and Orange sorghums and Johnson grass [*S. halepense*]. It appeared in experimental plots and commercial plantings, and was stated by one grower to have been present for 40 years. The fungus appears to be a vigorous parasite.

PARKER (E. R.). **Effect of zinc applications on the crop of Grapefruit trees affected with mottle-leaf.**—*Hilgardia*, xi, 2, pp. 35–53, 3 figs., 7 graphs, 1937.

The nature of the damage and the losses caused in grapefruit orchards by mottle leaf are fully described and illustrated. Treatment of grapefruit trees at the beginning of the blooming period with sprays consisting of 10 lb. zinc sulphate, 5 lb. hydrated lime, and 4 oz. powdered blood-albumin spreader in 100 galls. water [*R.A.M.*, xvii, p. 312] is reported to increase the total yield from badly affected trees by several hundred per cent., and to produce a striking improvement in size, shape, thickness of rind, and juice content of the fruits. Treated trees appeared to suffer no injury from hydrocyanic acid fumigations, which severely marked the fruit from untreated trees.

JENKINS (ANNA E.). **Elsinoe on Lemon fruits from Paraguay.**—*Phytopathology*, xxviii, 1, pp. 73–75, 1 fig., 1938.

The conidial (*Sphaceloma*) stage of *Elsinoe australis*, the agent of sweet orange scab [*R.A.M.*, xvi, p. 603], was recently detected in New York on two consignments of lemons imported from Paraguay. The diseased fruits were severely disfigured by burnt-sienna-coloured lesions. The fungus has not hitherto been observed in the United States, so that its appearance on fruit exposed for sale in the market constitutes a serious threat to the citrus industry. *S. australis* was isolated and cultured from the imported lemons and its viability thereby demonstrated.

BROOKS (C.) & MCCOLLOCH (L. P.). **Some effects of storage conditions on certain diseases of Lemons.**—*J. agric. Res.*, lv, 11, pp. 795–809, 3 figs., 9 graphs, 1937 (issued February, 1938).

A tabulated account is given of experiments from 1933 to 1936, inclusive, in which lemons of varying degrees of maturity, imported from Los Angeles, California, were stored at the Arlington Experiment Farm, Virginia, at five temperatures ranging from 32° to 60° F. The results showed that during the first six or eight weeks of storage more decay from fungal rots developed at the higher than at the lower temperatures, this being especially true of *Alternaria citri* [*R.A.M.*, xvi, p. 744; xvii, p. 310] rot, which is stated to have been the most common and was not controlled by carbon dioxide [ibid., xvi, p. 44; xvii, p. 312]; with longer periods of storage the amount of decay was sometimes greater at the lower than at the higher temperatures, apparently owing to the development of pitting and a watery breakdown similar to that in the grapefruit [ibid., xvii, pp. 189, 312]. Pitting was particularly bad at temperatures below 40°, but seldom serious at 50°, and did not occur at 60°; storage for one or two weeks at the lower temperatures before transference to the higher temperatures did not, however, increase pitting, while pre-storage treatments with high concentrations of carbon dioxide and waxing the lemons tended to decrease it. Membranous stain (or membranosis), characterized by a browning or darkening of the carpellary walls between the segments, sometimes extending to the central core and to the inner cortical tissues, developed most abundantly (75 to 100 per cent.) at 40°, while at 32°, 50°, and 60° its occurrence

was in the order of 1, 8, and 2 per cent., respectively; storing the lemons for one or two weeks at 32° before transferring them to 50° or 60° usually tended to reduce the percentage of stain developing at the two higher temperatures, but fruit held for one or two weeks at 40° before transference sometimes developed more. Waxing the lemons and storage in carbon dioxide atmospheres usually tended to decrease membranous stain. Scald and red blotch were occasionally found on fruit held at low temperatures. Pre-storage treatment with high concentrations of carbon dioxide tended to delay colour development in the immature fruit, but no other injury resulted from the treatment, or from the accumulation of low percentages of the gas in the storage atmosphere. Waxed fruit lost weight and firmness very much more slowly than unwaxed.

Klotz (L. J.) & Basinger (A. J.). **Water spot of Navel Oranges.**—*Calif. Citrogr.*, xxiii, 3, p. 115, 1938.

The disease of citrus known as 'water spot' in California [*R.A.M.*, xiv, p. 548] is a non-parasitic breakdown of the rind due principally to the imbibition of external water by the albedo. Invasion of the affected part by decay-producing fungi, chiefly blue and green moulds [*Penicillium italicum* and *P. digitatum*, respectively] causes the rapid decline known as 'water rot'. Under local conditions the trouble is important only on Navel oranges maturing during the rainy season, towards the end of which several days of continuously wet weather are enough to cause serious losses. Oranges with large open convolutions and growth cracks, fruit in an advanced stage of maturity, and varieties with weak rinds, such as the Thompson Navel orange, are very susceptible, while fresh wounds in the rind are important factors in increasing incidence. A preliminary test indicated that losses may be reduced by means of a protective spray of paraffin wax emulsion, while other important methods consist in early picking, orchard heating, the use of windbreaks, and the careful avoidance of injury.

Bain (F. M.). **Bronze leaf wilt disease of the Coconut Palm.**—48 pp., 8 pl., 4 figs., 5 graphs, 2 maps, Trinidad, Government Printing Office, 1937.

A detailed account is given of an exhaustive study carried out by the author in Trinidad of coco-nut bronze leaf wilt [*R.A.M.*, xiv, p. 579] and its control with particular reference to the influence of soil factors. The main cause of the disease is water deficiency in the plant; in some instances unbalanced nutrition, for which potash fertilizers serve as a remedy, may be a contributing factor.

The disease occurs on three classes of soil; (1) where the surface is of a close texture and overlies a subsoil impervious to water, with the result that waterlogging is common in wet periods, and the surface soil dries out rapidly in dry ones, (2) (*a*) where the soil and subsoil are of open texture and drain freely, with the result that in dry weather the water supply is poor, (*b*) where the soil and subsoil are compact and dry out rapidly in drought periods, and (3) where the top soil is friable, and the subsoil layer intolerant. Preventive measures in soils of the first class consist in deep draining and banking of beds, trenching, and

liming; in soils of the second class in irrigation, trenching and mulching, potash applications, and wider planting; in the third, no preventive measures are possible, and another crop should be substituted. It is pointed out that bronze leaf wilt symptoms result when air is cut off from the roots, and that spread of the disease in the direction of the wind may be explained from a consideration of the effect on transpiration.

Из работ станции защиты растений всесоюзного н.-и. хлопкового института. [Abstract of the investigations of the Plant Protection Station of the Pan-Soviet Institute for Scientific Research on Cotton.]—*Pl. Prot., Leningr., 1937*, 15, pp. 99–112, 1937.

This is a collection of papers by various authors on the control of blackarm [*Bacterium malvacearum*: *R.A.M.*, xvi, p. 171] of cotton. According to D. D. Verderevsky a comparison of seed disinfection methods proved that of nine different disinfectants formalin (1 : 100) was the most effective. In a further paper the same author states that experiments on the artificial infection of cotton with *Bact. malvacearum* have shown the following varieties to be absolutely immune from the disease: 02129 from Turkey, 5946 and 9331 from South India, 02289–1 from Manchuria, and 2869 from Mozar-y-Sheriff [ibid., xiv, p. 304]. All these belong to the 26-chromosome group, whereas the species usually grown in the U.S.S.R., such as *Gossypium hirsutum* and *G. barbadense*, belong to the 52–chromosome group. Recent investigations seem to indicate the possibility of breeding immune hybrids between these two groups.

In a paper on hot-water treatment of cotton seed as a measure of control against *Bact. malvacearum*, D. D. Verderevsky describes experiments in which seed was heated for one hour in hot water at temperatures ranging from 50° to 57° C.: it was found that at 56° to 57° C. almost complete sterilization was achieved. The author suggests that further studies in this direction would probably lead to the discovery of a most effective method of treatment against both internal and external seed infection.

Mme N. P. Lebedeva reports investigations on the bacteriophage of *Bact. malvacearum* [ibid., x, p. 662], in the course of which its presence was established in cotyledons, leaves, stems, and bolls of herbarium specimens and living diseased cotton plants. It was also found in the water of ponds near cotton plantations and the river Lybed near Kiev. The presence of the bacteriophage in the soil remains doubtful pending further experiments. Various tests showed that a temperature of 56° to 59° C. is lethal to the bacteriophage only after 60 mins.' exposure, whereas *Bact. malvacearum* is killed after 10 mins.' exposure at 54° to 56° C. The lysis is most effective for all strains of the bacterium at a temperature of 20° to 37° C. Experiments showed that three months' desiccation did not destroy the bacteriophage. The influence of sunlight was ineffective up to two hours, but after three hours' exposure either the lysis was lessened or the bacteriophage destroyed. It was possible to select three bacteriophages out of seven examined, which were lytic to all of the 25 original strains of *Bact. malvacearum* tested. Field experiments in 1936 in Tashkent showed that bacteriophage

treatment of cotton seeds in combination with vernalization lowered the infection by 74 per cent. in comparison with the control, but treatment of the seeds undertaken shortly before sowing showed very little effect.

Sabourova (Mme P. V.). Физиологическое изучение трахеомикозного увядания Хлопчатника. [Physiological study of the tracheomycotic wilt of Cotton.]—*Pl. Prot., Leningr., 1937*, 15, pp. 61–68, 1 graph, 1937. [English summary.]

Hothouse experiments with upland cotton No. 169, artificially infected with *Verticillium dahliae* [*R.A.M.*, xvii, p. 240] showed that transpiration was lowered by 30 to 40 per cent. in plants infected in the basal part of the stem and by 15 to 20 per cent. in plants infected at the base of the primordial leaf. The osmotic pressure in the leaves was also lowered by between 2 and 3 atmospheres. Planting in closer stands affording denser shade is recommended as a measure of control.

Moskovetz (S. N.). Курчавость листьев Хлопчатника в Азербайджанской С.С.Р. [Cotton leaf curl in Azerbaidjan.]—*Pl. Prot., Leningr., 1937*, 14, pp. 102–103, 1937.

Leaf curl disease of cotton [*R.A.M.*, xvi, p. 48] was first observed in Azerbaidjan in 1934, when 1 to 2 per cent. of the crop was diseased (20 per cent. in a few districts), the Egyptian varieties being mainly affected. In 1935 the incidence of infection amounted to 7·8 and 10·2 per cent. on the Egyptian strains Fuadi and Maarad, respectively, and to 0·5 to 1 per cent. on the upland varieties, and increased still further in the following year. The decrease in yield in diseased plants, chiefly due to reduced boll formation, in comparison with healthy ones, fluctuated between 35·5 and 54·2 per cent. In some varieties the yield of lint was reduced by 1·1 to 2·7 per cent. and the staple was shorter by 1·9 mm. Experiments with Maarad 1591 showed that the incidence of infection amounted to 11 per cent. when planting at 74 by 25 cm. and to 42·2 per cent. when planting at 80 by 80 cm.

Hansford (C. G.) & Hosking (H. R.). **Recent research in Uganda on blackarm disease.**—*Emp. Cott. Gr. Rev.*, xv, 1, pp. 7–13, 1938.

Most of the information given in this brief review of the work done on cotton blackarm (*Bacterium malvacearum*) in Uganda since 1932 has already been noticed from other sources [cf. *R.A.M.*, xvi, p. 455; xvii, p. 315]. No correlation has been established locally between the disease and insect pests, except that the ragged edges of leaves attacked by *Lygus* are rather more susceptible than undamaged leaves, but this enhanced susceptibility does not result in increased stem infection.

Lehman (S. G.). **Seed infestation with Glomerella and Fusarium in the 1936 Cotton crop in North Carolina.**—*Plant Dis. Reptr*, xxii, 1, pp. 4–6, 1938. [Mimeographed.]

In germination and disease tests made in February and March, 1937, on 35 lots of untreated cotton seed from 35 different farms in 19 counties in North Carolina an average of 81 per cent. of the seeds germinated. In all except 4 lots, 40 per cent. at least of the seeds showed the presence

of *Glomerella gossypii* [*R.A.M.*, xvi, pp. 410, 606], the range of per centage infection being 4 to 96, with a mean of 65·9. The average percentage of seeds bearing spores or mycelium of *Fusarium* was 31·4, *F. moniliforme* [*Gibberella moniliformis*: loc. cit.] being observed on many of the seedlings. In June, 1937 additional tests were made on seed from 24 of the same lots after delinting in acid and disinfection with mercuric chloride. The mean percentages of infection by *G. gossypii* and *Fusarium* spp. were only 8·1 and 6·3 per cent., respectively, the incomplete elimination of these fungi by the treatment being probably due to internal seed infection.

Singh (B. N.) & Choudhri (R. S.). **The effect of visible, ultra-violet and infra-red radiations upon the germination and the therapeutic treatment of Cotton seed.**—*Emp. Cott. Gr. Rev.*, xv, 1, pp. 35–42, 1 pl., 1938.

When cotton seeds artificially inoculated with various [unspecified] fungi were given (1) 5 minutes' exposure to mixed ultra-violet and infra-red radiation at 2 ft., (2) 2½ minutes' exposure to mixed radiation plus the same exposure to ultra-violet radiation at 2 ft., and (3) as in (2) but at distances of 2 ft. for the ultra-violet and 4 ft. for the infra-red, the fungi were killed in all cases, as compared with 100 per cent. survival in the case of the unexposed controls. Injury to the seed was roughly proportional to the intensity and duration of infra-red radiation, prolonged exposure to which from short distances inhibited germination. It is concluded that ultra-violet radiation may safely be used for the surface sterilization of cotton seeds, but when fungal infection is deep, complete control is secured only by the combination of ultra-violet and infra-red rays.

Bréjoux (D.). **L'utilisation de microbes pathogènes dans la lutte contre la Pyrale, l'Eudémis et la Cochylis.** [The use of pathogenic microbes in the campaign against *Pyralis*, *Eudemis*, and *Cochylis*.]—*Agric. prat., Paris*, N.S., cii, 2, pp. 56–57, 1938.

In connexion with a brief survey of the system of combating insect pests by spraying their hosts with spore emulsions of pathogenic bacteria [*R.A.M.*, xvii, p. 35] at the rate of 1 gm. per l. water, the writer cites some figures illustrating the results of tests on these lines made by Métalnikov for the control of *Eudemis* [*Polychrosis botrana*] on vines in various parts of France. In one locality, 5,224 grapes on 100 control bunches were infested, the corresponding number for 100 treated bunches being only 416; the yield of a chemically treated plot amounted to only 320 kg. compared with 657 kg. in a similar plot sprayed with bacterial spores. In another district there were 16,350 grapes attacked in the control plot and only 1,884 in the sprayed one. With other data of a comparable order, these results indicate an efficiency of 90 per cent. for the method.

Martin (D. S.) & Conant (N. F.). **A comparative study of nineteen strains of Blastomyces dermatitidis Gilchrist and Stokes, 1898.**—Abs. in *J. Bact.*, xxxv, 1, pp. 38–39, 1938.

Since *Blastomyces* [*Endomyces*] *dermatitidis* [*R.A.M.*, xvii, p. 178]

was isolated from American blastomycosis, and described under that name by Gilchrist and Stokes in 1898, various other names have been applied to the same fungus. A comparison of 19 strains, including 13 cultures previously labelled *B. dermatitidis*, was made at the Duke University School of Medicine, Durham, North Carolina, with cultures of *Glenospora gammeli*, *Blastomycoides tulanensis*, *Monosporium tulanense* [ibid., xv, p. 295], and *E. capsulatus* and its var. *isabellinus* [ibid., xiv. p. 582]. No essential differences between the different strains were noticeable in culture and all the strains were further shown by serological tests to be similar in their antigenic structure. It is concluded, on the basis of these observations, that 21 names [which are listed] should be reduced to synonymy with *Blastomyces dermatitidis*, the sole agent of Gilchrist's disease.

Zelman (J.). **Disseminated coccidioidal granuloma.**—*Calif. West. Med.*, xlvii, 5, pp. 327–329, 2 figs., 1937.

Full clinical details are given of a fatal case of disseminated coccidioidal granuloma (*Coccidioides*) [*immitis*: *R.A.M.*, xvii, p. 112] in a 36-year-old white male at the San Diego County Hospital, California.

Levin (E. A.). **Torula infection of the central nervous system.**—*Arch. intern. Med.*, lix, 4, pp. 667–684, 7 figs., 1937.

A detailed account is given of two cases (both men) at the Cleveland (United States) City Hospital of torulosis of the central nervous system caused by *Torula histolytica* [*Debaryomyces neoformans*: *R.A.M.*, xvii, p. 111], bringing the total number of records of this disease to sixty.

Castellani (A.). **A short general account for medical men of the genus Monilia, Persoon, 1937. Em. Bonorden, 1851; Vuillemin, 1911; Castellani and Chalmers, 1919; Pollacci and Nannizzi, 1927.**—*J. trop. Med.* (*Hyg.*), xl, 23, pp. 293–307, 17 figs., 1937.

A concise account is given of the taxonomy, cultural and biological characters, pathogenicity to man and animals, and morphology of the genus *Monilia* [*Candida*], illustrated by a number of representative species [cf. *R.A.M.*, xvi, p. 176 *et passim*].

Wickerham (L. J.) & Rettger (L. F.). **A study of Monilia albicans with emphasis on morphological types and chlamydospore production.**—Abs. in *J. Bact.*, xxxv, 1, p. 39, 1938.

Forty-seven strains of *Monilia* [*Candida*] *albicans* [*R.A.M.*, xvii, p. 176] isolated from human, and 10 from avian, sources were studied by a modification of Dalmau's technique and found to be arbitrarily divisible into four overlapping types and a fifth group composed of a few degenerate strains. The fermentation reactions for the four main types were identical, and all produced chlamydospores in 96 hours. The only other closely related fungi forming these organs are *Endomyces* spp., which are readily separable from the *Monilia* groups by their production of ascospores on maize meal agar. The early development of chlamydospores of distinctive appearance is therefore thought to constitute an important diagnostic feature of *C. albicans*.

Keiper (T. W.). **Studies on yeastlike fungi isolated from pulmonary disease (bronchomoniliasis).**—*J. Lab. clin. Med.*, xxiii, 4, pp. 343–354, 4 figs., 1938.

Three out of 100 students examined at Stanford University (United States) were found to harbour species of *Monilia* [*Candida*] in their throats. The incidence of pulmonary disease [*R.A.M.*, xvii, p. 320] caused by these organisms in 178 cases was 2·93 per cent. The ability to utilize carbohydrates with the production of acid, or acid and gas combined, was not found to be a reliable criterion for the classification of these organisms, supplementary precipitin and agglutinin absorption trials being required. The fungi concerned in the cases under observation were *M.* [*C.*] *albicans*, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*: ibid., xvi, p. 811].

Schonwald (P.). **Allergenic molds in the Pacific Northwest.**—*J. Allergy*, ix, 2, pp. 175–179, 2 graphs, 2 charts, 1938.

Air-borne spores of *Rhizopus nigricans*, *Penicillium expansum*, *Trichoderma koningi*, and seven other moulds were trapped on 145 plates exposed throughout the year 1936 in the city of Seattle, Washington, in residential districts, and at various points along the Pacific Northwest coast [cf. *R.A.M.*, xvii, p. 243]. Of 150 cases tested by the scratch and intradermal methods, only five failed to react to any of the mould extracts. Of 86 patients treated with these preparations, 66 (76·7 per cent.) showed definite improvement in a comparatively short time, the relief thus obtained also extending to other forms of abnormal sensitization, such as asthma, rhinitis, hay-fever, dermatitis, eczema, and so forth.

Milochevitch (S.) **Neue Auffassungen über die Ätiologie des Favus beim Menschen.** [New ideas concerning the etiology of human favus.]—*Med. Rev., Belgrade*, xii, pp. 81–85, 1937. [Serbocroatian, with French summary. Abs. in *Zbl. Haut- u. GeschlKr.*, lviii, 8–9, p. 570, 1938.]

According to Sabouraud, *Achorion gypseum* and *A. schoenleini* are alone capable of inducing favus capillitii. The changes caused in the glabrous skin by *A. violaceum* [*R.A.M.*, xvi, p. 253] are not, apart from scutulum formation, characteristic of favus, and it would be more correct to refer such cases to *Trichophyton violaceum* [ibid., xvii, p. 321]. *T. album* [loc. cit.], however, is certainly able to provoke typical favus of the scalp, and a differential mycological diagnosis between this fungus and *A. schoenleini* can only be established by the behaviour of the two organisms in the hair. It is considered probable that *A. schoenleini* is merely a derivative of *T. album*, which also comprises, for example, *T. discoides* and *T. ochraceum* as representatives of the large-spored faviform group [cf. ibid., xvi, p. 810].

Allison (C. C.) & Christensen (J. J.). **Studies on inheritance of resistance to wilt in Flax.**—Abs. in *Phytopathology*, xxviii, 1, p. 1, 1938.

From 1934 to 1937 the inheritance of resistance of flax to wilt (*Fusarium lini*) was studied in the progeny of 56 crosses involving 18 varieties

differing noticeably in their reaction to the disease (5 to 100 per cent. infection) in flax-sick soil. In general, the F_1 crosses were intermediate in resistance between the two parents, although in certain crosses susceptibility or resistance appeared to be dominant. The types of segregation observed in the F_2, F_3, and F_4 denote the existence of several factors for resistance. When Bison [*R.A.M.*, xi, p. 182; xvi, p. 41] was used as the resistant parent, the percentage of resistant segregates obtained usually exceeded the number derived from other equally resistant varieties. Some F_4 and F_5 progenies of crosses between Bison (wilt-resistant but susceptible to rust [*Melampsora lini*]) and Newland (very susceptible to wilt but immune from rust) are resistant to both diseases, besides possessing certain desirable agricultural characters.

Pavloushin (P. J.). Активные методы выявления устойчивых к болезням сортов Льна. [Methods for testing varieties of Flax for resistance to diseases.]—*Pl. Prot., Leningr., 1937*, 15, pp. 34–43, 1 graph, 1937. [English summary.]

The following 'provocative' method is recommended in breeding flax varieties resistant to fungous diseases [see preceding abstract]. The reaction of varieties to *Fusarium lini* can be well shown by inoculating the soil with infected straw 4 to 6 days before sowing and keeping the soil well moistened during the growing period. The straw is introduced into the soil at a depth of 3 cm. in small fragments 1 to 1·5 cm. in length, at a rate of 50 to 100 gm. per sq. m. The reaction to *Melampsora lini* is sufficiently demonstrated by late and thin sowing and abundant nitrogen fertilization. The reaction to *Polyspora lini* can be best seen when the plant is infected with a pure culture of this fungus in the period between the bud stage and flowering.

Green (D. E.). **Antirrhinum rust.**—*J. R. hort. Soc.*, lxii, 12, pp. 530–537, 1937.

Summing up the present position with regard to *Antirrhinum* [*majus*] rust [*Puccinia antirrhini*] in Great Britain [*R.A.M.*, xvi, p. 678], the writer states that the American varieties now undergoing resistance tests at the Royal Horticultural Society's Garden, Wisley, Surrey, do actually escape infection to the extent of 75 per cent. of the plants, as claimed by their originators, though the remaining 25 per cent. may be infected quite severely. Attempts are now in progress to improve the somewhat dull colour of these resistant stocks by back-crossing with susceptible parents of more pleasing appearance, and promising results have already been obtained along these lines, especially with the tall yellow varieties. In the 1937 tests, all four old varieties succumbed to the rust in August, one out of six Wisley-raised stocks showed every plant diseased, while in the remaining five resistance ranged from 50 to 76 per cent.; in two out of eight American varieties every plant was free from infection, and the remainder were from 73 to 91 per cent. resistant.

Mains (E. B.). **Additional studies concerning the rust of Iris, Puccinia iridis.**—*Phytopathology*, xxviii, 1, pp. 67–71, 1938.

Certain bearded *Iris* varieties, e.g., Ivory Coast, Leonato, San Rafael,

Santa Fe, and *I. longipetala*, at Berkeley, California, were reported by M. W. Gardner in 1934 to suffer severely from rust (*Puccinia iridis*) [*R.A.M.*, xv, p. 99]. The physiologic race of the rust concerned in the outbreak is a hitherto unnamed one, to which the designation *californica* is here applied. In the writer's inoculation experiments most of the bearded varieties proved highly resistant to the new race, which caused a moderate degree of infection, however, on Magnifica, Oruga, and San Rafael, while none was infected by *P. iridis* race *septentrionalis*. On the other hand, all the English *Iris* varieties tested were very susceptible to both races: among the Spanish and Dutch varieties outstanding resistance was shown by Cajanus, David Bliss, Imperator, King of Blues, and Wedgwood.

D'Oliveira (Maria de L.). **Uma doença bacteriana do Ligustrum japonicum, Thumb.** [A bacterial disease of *Ligustrum japonicum*, Thumb.]—*Rev. agron.*, xxiv, 4, pp. 425–435, 4 figs., 1936. [English summary. Received April, 1938.]

Privet (*Ligustrum japonicum*) in the Lisbon district of Portugal is stated to suffer from an apparently undescribed bacterial disease characterized by the presence on the leaves of small, circular, black spots, sometimes very numerous, and general slight stunting of the whole plant. The causal organism, *Bacterium ligustri* n.sp., closely resembles *Bact.* [*Pseudomonas*] *syringae*, from which it differs, however, in carbohydrate fermentation and other minor reactions. *Bact. ligustri* is a rod with rounded ends, occurring singly or in pairs and measuring 1·3 to 3 by 0·5 to 0·7 μ, motile by 2 to 5 polar flagella, Gram-negative, non-acid-fast, liquefying gelatine, forming white colonies on agar media, with a conspicuous greenish pigment on Dox's agar, not reducing nitrates or producing ammonia or indol, coagulating milk, making no growth on Cohn's solution but developing freely on Fermi's and Uschinsky's, with pigmentation, and evolving no gas from carbohydrates but acid from galactose, arabinose, and mannose. Entry into the plant was experimentally shown to be gained exclusively through wounds, such as those inflicted by severe pruning under natural conditions.

Buddin (W.) & Wakefield (E[lsie] M.). **Stem-canker of Gardenias.**—*Gdnrs' Chron.*, ciii, 2664, p. 45, 1 fig., 1938.

A Latin diagnosis is given of *Phomopsis gardeniae* n.sp., the agent of stem canker of *Gardenia* in England [*R.A.M.*, xvi, p. 614; cf. next abstract]. On re-examination, after an interval of six months, of subcultures of the fungus on sterilized *Gardenia* twigs B spores were detected in profusion among the A spores previously described, the former being filiform, curved or hook-shaped, and measuring 25 by 1 μ.

Hansen (H. N.) & Barrett (J. T.). **Gardenia canker.**—*Mycologia*, xxx, 1, pp. 15–19, 1 pl., 1938.

Details are given of morphological and cultural studies in Berkeley, California, of the species of *Phomopsis* first recorded in that State in 1932 [*R.A.M.*, xiii, p. 379] causing stem canker and galls on gardenias, and which has since been also reported from several other of the United States and from England [see preceding abstract]. Comparisons of the

Californian fungus with isolates from Illinois, Kansas, and Washington, showed that all were apparently identical. The organism is characterized by its irregular zonate type of growth in culture, with dispersed pycnidia produced in abundance to within 5 mm. of the outer margin, and also by the fact that the A type spores contain many oil globules instead of the two typical for the genus. It is considered to be new to science and is named *P. gardeniae* [with a Latin diagnosis]. The conidiophores are hyaline, awl-shaped, 12 to 18 by 2·5 to 3·3 μ. The A spores are continuous, hyaline, elliptical-fusiform, 6·8 to 12·3 by 2·7 to 4·3 μ (mostly 8·5 to 10·2 by 3·2 to 3·6 μ), and the B spores are continuous, hyaline, filiform, curved or flexuous, and 13·6 to 32·5 by 1·1 to 2·1 μ (mostly 18·2 to 27·2 by 1·4 to 1·8 μ). [This species, published on 1st February, 1938, is antedated by *P. gardeniae* Budd. & Wakef., dated 15th January, 1938: loc. cit.]

Hagemann (H.). **Neue Wege im Kampfe gegen Schädlingsbefall in der Staudenanzucht.** [New methods in the campaign against diseases in the cultivation of shrubs.]—*Blumen u. PflBau ver. Gartenwelt*, xlii, 1, pp. 5–6, 1 fig., 1938.

It has repeatedly been observed of late in Germany that flowering plants and shrubs ordinarily regarded as disease-resistant have suddenly been attacked by fungal pathogens, a recent example being the infection of *Pyracantha coccinea* by *Fusicladium* [*pirinum* var. *pyracanthae*: *R.A.M.*, xvi, p. 515]. The phenomenon is attributed to the widespread practice of mass cultivation of a single plant species ('monoculture'), which affords particularly favourable conditions for fungal invasion, and attempts are in progress in a nursery-garden at Bornim to remedy the situation by the introduction of a more natural system of mixed plantings. For instance, the interposition of *Avena candida* and *Koeleria glauca* between *Viola cornuta* and *Phlox subulata*, both subject to rusts [*Puccinia violae*: ibid., xiii, p. 532, and *P.* sp., respectively] completely eliminated the diseases. The plants used for interplanting should differ as widely as possible in growth habit from those to be protected.

Willis (L. G.) & Piland (J. R.). **A response of Alfalfa to borax.**—*J. Amer. Soc. Agron.*, xxx, 1, pp. 63–67, 2 figs., 1938.

Continuing their studies on the yellowing of lucerne due to boron deficiency in North Carolina [*R.A.M.*, xvii, p. 44], the writers found that a combination of copper, manganese, and zinc sulphates at the rates of 5, 10, and 10 lb. per acre, respectively, produced similar beneficial effects to those obtained with borax (5 to 10 lb.). At the outset the disorder was thought to be confined to sandy soils, but further observations have shown it to be general in lucerne fields throughout the State.

Rasmussen (E. J.). **Effect of delay in storage and storage temperature on the keeping qualities of Apples.**—*Tech. Bull. N. H. agric. Exp. Sta.* 67, 55 pp., 10 figs., 2 graphs, 1937.

During the five years' apple storage investigations commencing in 1930 at the New Hampshire Agricultural Experiment Station, temperature was found to be one of the most important factors influencing

keeping quality. In common storage McIntosh declines rapidly in firmness and acidity, but develops the best flavour and aroma; this variety is in prime eating condition a month after harvest. At 30° F. firmness and acidity are retained, but brown core [*R.A.M.*, xv, p. 485] is prevalent and the characteristic flavour does not develop. At 32° brown core is less in evidence and the taste of the fruit in mid-winter is somewhat superior. By 10th May wastage was greater in McIntosh apples stored immediately after picking than in the lots delayed for five days, owing to the abundant development of brown core in the former. The fruit delayed for ten days before storage showed 43 per cent. wastage on the same date, or twice as much as that stored immediately and less than half the incidence in the apples kept for 20 days prior to storage. Other cases of wastage in this variety include [unspecified] decay, external and internal breakdown [ibid., xvi, p. 468], and mealy breakdown [ibid., xiv, p. 592].

Similar considerations apply in general to Baldwins, the causes of wastage in which, besides the foregoing, include bitter pit.

Apple scab [*Venturia inaequalis*] lesions were found to increase in size during common storage by up to 43·4 per cent. on Baldwins, the corresponding figure for fruit kept at 30° being 30·4 (9th March). In the case of McIntosh the increase on the same date on fruit in common storage was 8·8 and on that kept at 30° 3·3 per cent. [ibid., xvii, p. 117]. Late infections develop more rapidly than early ones.

Too early harvesting of Cortland apples results in the development of scald [ibid., xv, p. 485] in storage, while undue delay is apt to lead to breakdown. Fruit harvested with a tinge of yellow in the ground colour (10th October in 1933) was observed to show very little scald in storage.

Rigg (T.) & Chittenden (E.). **Influence of manurial treatment on yield and storage quality of Cox's Orange variety of Apples.**—Reprinted from *Orchard. N. Z.*, x, pp. 272–274, 1937.

The application to Cox's Orange apples on a poor phase of the Moutere Hills, Nelson, New Zealand, where this variety is extensively grown, of a top dressing of 3 lb. ammonium sulphate per tree about the third week in September has been found, in six years' observations (1931–6), to induce fairly high percentages of [unspecified] fungal decay and internal breakdown [see preceding abstract] in cool storage (38 ° F.).

Baines (R. C.). **Phytophthora trunk canker of Apple.**—Abs. in *Phytopathology*, xxviii, 1, p. 2, 1938.

Physiologic races of *Phytophthora cactorum* were differentiated [? in Indiana] on the basis of their varying pathogenicity in inoculation experiments from pure cultures into the trunks of 10- and 11-year-old Gano, Grimes, King, Northwestern Greening, Rome, Smokehouse, and Stark apple trees [*R.A.M.*, xv, p. 633; xvii, p. 254]. A culture of the fungus from *Lilium candidum* infected the varieties King, Rome, and Stark, one from lilac [ibid., xi, p. 579] attacked King, and one from loquat was pathogenic to Grimes, King, Northwestern Greening, Rome, and Stark.

Single cultures isolated from apple, citrus, peony, pine, and snapdragon [*Antirrhinum majus*: ibid., xv, p. 518] failed to infect the above-mentioned seven apple varieties and 24 others resistant to the fungus. Seven of the 8 cultures isolated from bark cankers, 3 out of 4 from apple fruits, 1 of the 2 from peony, and 2 from soil were pathogenic to Grimes. The trunks of 2-, 3-, and 4-year-old Grimes were resistant to infection, while those of 8- to 30-year-old trees of this variety were susceptible. Large branches were more resistant than the trunks.

CAMPAGNA (E.). **Observations préliminaires sur la rouille du Pommier dans le Québec.** [Preliminary observations on Apple rust in Quebec.]—*Bonne Terre*, xix, 1–2, pp. 15–30, 6 figs., 2 maps, 1938.

A brief, semi-popular account is given of the symptoms, life-cycle, etiology, and control of apple rust (*Gymnosporangium clavipes*) [*R.A.M.*, xvi, p. 618], with notes on its distribution and economic importance in Quebec. The disease was first observed in the province in 1929, on about a dozen Jaune Transparente and McIntosh fruits; a year later, about 15 trees were found to be affected, and by 1932 the number had risen to several hundreds. The affected locality extends from Montmagny to Rivière du Loup. The disease cannot spread farther west than the eastern extremity of the Ile d'Orléans as between this and the American frontier no juniper trees (*Juniperus communis* var. *depressa*) appear to be present. The area that may, however, become affected contains about 83,962 apple trees. Observations on about 500 trees in an orchard at Sainte-Anne in 1934 showed the following varieties to be unaffected, viz., Golden Russet, Pewaukee, Pêche, Astrachan, Hyslop, and Martha, the following (arranged in order of decreasing susceptibility) being affected: Alexandre, St. Laurent, Excelsior, Greening, Duchesse, McIntosh, Toleman, Milwaukee, and Wealthy.

The host range of the different stages of the rust on Pinaceae and Pomaceae near Quebec is given. It is recommended that no junipers be planted in the regions where they are not found.

YOUNG (H. C.) & WINTER (H. F.). **The effect of boron, manganese, and zinc on the control of Apple measles.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxii, 188, pp. 147–152, 5 figs., 1937.

In a test carried out in Ohio to ascertain the effect of minor elements on the control of apple measles [*R.A.M.*, xvi, p. 440], in which Red Delicious trees were grown in sand cultures with a complete nutrient solution with and without the addition of boron, manganese, and zinc, the results obtained strongly indicated that lack of boron in a growing Delicious apple tree is the cause of much of the condition known as internal bark necrosis [ibid., xiv, p. 372]. While the experiment did not prove that the pimply, necrotic condition that developed was identical with measles, the necrosis induced was macro- and microscopically indistinguishable from measles. Boron corrected this condition. Although no definite recommendations are made from these results, it is suggested that borax applications might be made tentatively to affected apple trees at rates ranging from $\frac{1}{8}$ to $\frac{1}{4}$ lb. per year of growth.

HILDEBRAND (E. M.). **The blossom-blight phase of fire blight, and methods of control.**—*Mem. Cornell agric. Exp. Sta.* 207, 40 pp., 3 pl., 5 figs, 1937.

Investigations carried out at Cornell during a period of four years on the control of the blossom blight phase of fireblight [*Erwinia amylovora*: *R.A.M.*, xvii, p. 48] of apple, pear, and quince trees demonstrated it to be an essential supplement to canker eradication. Under field conditions, Bordeaux mixture (1–3–50) and copper-lime dust (20–80) caused no appreciable reduction in fruit set under good pollination conditions. Under laboratory conditions, low concentrations of bactericides, such as would be used in the field, acted as repellants to bees, but lengthened their life. Field observations indicated that blossom bactericides had no deleterious effect on bees.

The bacteria enter unwounded flowers through the intercellular spaces, stomata, nectar-secreting stomata, and, possibly, hydathodes. The only place in which the organism was conclusively demonstrated to overwinter was in the tree cankers; it is very unlikely that overwintering occurs in the beehive. Greenhouse tests on dwarf pear trees showed that the blossoms were most susceptible to infection during the two days after opening, susceptibility subsequently declining.

Field experiments demonstrated that the most effective single application was that made at full bloom. Of the materials tested, Bordeaux mixture (1–3–50) and copper-lime dust (20–80) gave the best control. In one orchard in 1933, the early- and full-blossom applications of Bordeaux mixture (1–3–50) reduced blossom blight of apple trees by 40 and 57 per cent., respectively, combined early- and full-blossom treatment reducing it by 67 per cent. Results obtained in other orchards in the same year and succeeding ones demonstrated that the full-bloom application was of more value than any other single treatment, though under certain conditions the early-bloom application was of almost equal importance, in which case two applications were particularly effective. In limited trials, cuprous oxide, copper phosphate [ibid., xvii, pp. 224, 260], and coposil [ibid., xvii, p. 223] showed promise.

DEMAREE (J. B.) & DARROW (G. M.). **The red-stele root disease of Strawberries in the north-eastern United States.**—*Plant Dis. Reptr*, xxi, 22, pp. 394–399, 1937. [Mimeographed.]

A strawberry disease first recorded by H. W. Anderson in 1935 from widely separated localities in Illinois and the neighbouring States under the name 'black stele' root disease, but now termed 'red stele' was observed in 1936 and again in 1937 in the Eastern Shore district of Maryland. Numerous affected plants were found, showing a typically discoloured central cylinder in the larger fleshy roots. Many plants in a one-year-old field were wilting, and others were stunted, and had small, reddish leaves on short petioles. The disease was also observed in New Jersey, New York, Michigan, and Virginia, being most prevalent at three localities in Maryland, where the plants were growing in low, wet, unsuitable situations. It appeared to be limited everywhere to a very small percentage of the acreage planted to strawberries, and to be of minor importance. A Pythiaceous fungus with abundant, large,

thick-walled bodies, presumably oospores, was commonly present in the reddened stele of affected roots, and has been readily cultured.

It is doubtful, however, whether red stele is identical with the red core disease in Scotland due to *Phytophthora* sp. [allied to *P. cinnamomi*: *R.A.M.*, xvi, p. 515] as, apart from the low virulence of the former disease, there seems to be some difference in the symptoms, the fleshy roots affected by red stele being white and without any external sign of disease, and furthermore the red stele fungus has not been found in the cortex.

Demaree (J. B.) & Darrow (G. M.). **Leaf variegation in Strawberries not considered a virus disease.**—*Plant Dis. Reptr*, xxi, 22, pp. 400–403, 1937. [Mimeographed.]

The strawberry leaf yellowing and variegation known variously as 'June yellows', 'gold leaf', and 'suspected mosaic', [*R.A.M.*, xiii, p. 40; xvi, pp. 439, 545] has become so serious on the Blakemore variety in the United States since 1933, that nearly all the plantings observed by the authors showed the condition, which in some cases affected 25 to 50 per cent., and in extreme cases all, of the plants. Numerous other commercial varieties in widely separated localities are attacked, as are all the principal wild species. The evidence obtained by various workers points to the disease being non-infective, while careful breeding work has indicated that its origin is probably genetic, suggesting that it results from sporting or mutation, is a genetic weakness of the varieties affected, and is not due to a virus. The discovery and propagation of varieties which are not affected, or turn yellow slowly, offers an immediately practical method of control.

Demaree (J. B.) & Wilcox (Marguerite S.). **The black-seed disease of Strawberry.**—Abs. in *Phytopathology*, xxviii, 1, p. 6, 1938.

Serious damage to strawberry fruits is occasionally caused in Maryland and North Carolina by the ordinarily unimportant foliar pathogen, *Mycosphaerella fragariae* [*R.A.M.*, xvi, p. 394], which produces the so-called 'black seed' disease. The blackened achenes are conspicuous on the white unripe fruits and on ripe fruits of pale-coloured varieties. The affected berries usually bear only one or two spots, but as many as eight or ten may be detected in rare cases. Infection is believed to occur by way of the stigma, the fungus (which culturally and morphologically resembles the conidial stage of *M. fragariae*) ramifying throughout the seed and closely associated pulpy tissues. The typical symptoms of the disease were induced in the greenhouse by the inoculation of young berries with cultures isolated from the infected fruit tissue, leaf spot lesions, and ascospores of the fungus. Characteristic foliar injuries were also produced by the inoculation of young leaves with cultures isolated from 'black seed' berry tissues.

Bain (H. F.). **Production of synthetic mycorrhiza in the cultivated Cranberry.**—*J. agric. Res.*, lvi, 11, pp. 811–835, 10 pl., 1937 (issued February, 1938).

After reviewing the work hitherto done by Miss Rayner and others on the mycorrhiza in the Ericaceae [*R.A.M.*, xv, p. 308 *et passim*], the

author gives a fully illustrated account of his investigations since 1932, in the course of which he isolated four mycorrhizal fungi from 'hyphal complex' cells in the roots of *Vaccinium macrocarpum*, *V. canadense*, *Chamaedaphne calyculata*, and *Ledum groenlandicum*. The four organisms were grown in pure culture, and although they failed to produce fructifications permitting of their identification, they were obviously specifically distinct from one another and from *Phoma radicis* as described in the literature, or when compared with a culture of *P. radicis callunae* Rayner, obtained from the Centralbureau voor Schimmelcultures, Baarn. All four reproduced the complex form of mycorrhiza in cranberry seedlings grown in sterilized agar, and the fungus from cranberry also produced mycorrhiza in cranberry seedlings grown in an inoculated artificial soil composed of ground cork and sand. No mycorrhiza developed in seedlings grown in artificial media in the absence of the endophytes. Experiments with synthetic media showed that the cranberry fungus produced the mycorrhiza more freely if carbohydrates were lacking, and that seedlings grown in nutrient-free distilled water agar derived no measurable benefit from the presence of mycorrhiza. Cranberry roots were further shown to be highly sensitive to the composition of the nutrient media, the toxicity of which to the roots was increased in certain cases in the presence of the endophytes, while the toxicity of certain other substrata was decidedly reduced. These changes in the media were not correlated with mycorrhizal infection. No evidence of systemic infection of the type attributed by some investigators to *P. radicis* could be found either in the seedlings or in prepared slides from field material, and until the invariable existence of systemic infection is more conclusively demonstrated, and more definite proof is forthcoming that root suppression is due to lack of such infection, the hypothesis of an obligate relationship of mycorrhizal fungi to root formation in the Ericaceae is not considered valid.

Brown (Nellie A.). **Blueberry galls produced by the fungus Phomopsis.** —*Phytopathology*, xxviii, 1, pp. 71–73, 1 fig., 1938.

Blueberries [*Vaccinium* spp.] of the Cabot and Pioneer varieties in Massachusetts, New Jersey, Oregon, and Michigan are liable to a disease characterized by the formation on the crown and along the stem of light-coloured, later darkening, nodular growths protruding 5 mm. to 3 cm. or more from the surface and closely resembling those due to crown gall (*Bacterium tumefaciens*), but experimentally shown to be caused by a species of *Phomopsis*, which was also pathogenic to *Viburnum opulus* and *Jasminum nudiflorum* [*R.A.M.*, xiv, p. 174; xvi, p. 41]. The trouble may be effectively combated by reasonable care in propagation and by the destruction of infected parts during the autumn.

Baker (R. E. D.). **Notes on the control of Mango anthracnose (Colletotrichum gloeosporioides).**—*Trop. Agriculture, Trin.*, xv, 1, pp. 12–14, 1 graph, 1938.

The author states that in Trinidad and other West Indian Islands some of the more valuable mango varieties are often severely attacked by *Colletotrichum gloeosporioides* [*R.A.M.*, xvi, p. 301], which causes a serious blossom blight and a typical anthracnose of the ripening fruit;

the latter condition is characterized by the development, at about the time that the fruit attains maturity, of black spots, which gradually become sunken and coalesce, until in a few days at tropical temperatures the whole fruit is involved. The spots are often concentrated at the stem end and sometimes in stripes down the sides of the fruit, suggesting the distribution of the spores by rainwater over the surface of the fruit. Details are given of an attempt to control both blossom blight and anthracnose in 1937 on four Julie mango trees by weekly spraying of the flower spikes and fruits with 1 per cent. Burgundy mixture from the time of the formation of the first flowers in January until the fruit was harvested between May and July. The control of blossom blight was not very satisfactory, but the difference between the fruit collected from the sprayed trees on 7th and 18th May and 24th June and stored at tropical temperatures and the controls was striking; on the unsprayed mangoes latent anthracnose infections became visible as the fruit began to ripen, and three or four days after ripening had commenced the fruit was usually completely black and worthless; on the sprayed fruits, on the other hand, very few or no spots at all developed, the mangoes ripened five or six days after picking, and remained in good condition sometimes for as long as six or seven days after they had ripened. Washing the fruit in running water and drying with a clean cloth immediately after picking had no effect on the incidence of anthracnose, showing conclusively that the latent infections were established before the fruit was harvested. In view of these promising results further experiments are planned for determining the minimum number of sprayings required and the best times of application.

[Barnes (A. C.)]. **Leaf spot disease of Bananas.**—*J. Jamaica agric. Soc.*, xli, 12, pp. 603–607, 1937.

At a meeting of the Board of Management of the Jamaica Agricultural Society on 1st December, 1937, the Director of Agriculture stated that the indications at present are that banana leaf disease [*Cercospora musae*: see above, p. 375] will be confined locally to areas where the conditions for cultivation are not wholly favourable. A year ago considerable alarm was felt in some of the infected districts, but when the time arrived for preventive measures to be applied most of the affected plants had almost recovered. The disease is not a limiting factor to production in localities where the growing conditions are favourable. Actually, infection is present all over the island, but in St. Mary, Portland, and St. Thomas only a few spots are found, and those only on the oldest leaves. In a very mild form the disease has probably been present in Jamaica for a long time.

Fifteen months' work by the Department of Agriculture showed that, where the conditions justify the procedure and infection is serious, spraying or dusting should begin about the middle of March, and continue at intervals of three weeks until the end of April or the beginning of May. Treatment should be resumed in July, and continued until the beginning of October. In areas of high production it should continue throughout the whole year. Spraying with Bordeaux mixture is more effective than dusting; the spray should be applied effectively to the newest leaves just unfolding, and a few older ones. Owing to

the practical difficulties involved, however, dusting with finely ground copper sulphate and lime is preferable to spraying. The total cost of each application of dust amounts to about 8*s.* per acre.

CRANDALL (B. S.). **Persimmon wilt.**—*Plant Dis. Reptr*, xxi, 18, p. 338, 1 map, 1937. [Mimeographed.]

The only locality in the United States where persimmon wilt, caused by a species of *Cephalosporium*, has so far been found is an area of about 1,500 square miles south of the Cumberland river, in Tennessee, where about 50 per cent. of the stands contain infected trees.

ANAGNOSTOPOULOS (P. T.). *Τὸκυκλοκόνιον τῆς Ἐλαίας ἐν Ἑλλάδι.* [The *Cycloconium* of the Olive in Greece.]—*Hort. Res., Athens, 1937*, 4, pp. 357–367, 3 figs., 1937. [English summary. Received April, 1938.]

Severe damage is stated to be caused to the Greek olive crop by *Cycloconium oleaginum* [*R.A.M.*, xvi, p. 546], especially in orchards where the cultivation of cereals and fodders among the trees depletes the soil of its natural moisture and inorganic matter. The observations herein reported were conducted on the Attic variety, which responded satisfactorily to cultural measures of control, including green manuring, two ploughings (October and February), pruning, irrigation, fertilizing, and wide spacing of the trees in unirrigated orchards. Under the adverse conditions indicated above even normally resistant varieties are prone to infection by *C. oleaginum*, which may result in extensive defoliation.

MONTGOMERY (H. B. S.) & MOORE (M. H.). **A laboratory method for testing the toxicity of protective fungicides.**—*J. Pomol.*, xv, 4, pp. 253–266, 1 pl., 1938.

Full details are given of the method devised by the authors for evaluating the toxicity of plant protectives [*R.A.M.*, xvii, p. 261], in which 0·015 c.c. of the preparation to be tested is spread with a fine-bore pipette over circular areas 15 mm. in diameter, delimited on glass slides; after evaporation of the liquid and desiccation of the deposit, 0·04 c.c. of a water suspension of washed conidia of *Venturia inaequalis* is applied in a similar manner, the slides are incubated in a saturated atmosphere at 20° C. for at least 24 hours, and the amount of germination of the spores is then recorded at intervals. If desired, the spray deposit may be washed with water [in a special apparatus the construction of which is described] before the conidial suspension is applied. A brief account is also given of a method of growing *V. inaequalis* in pure culture for the production of conidia, and of freeing the suspension from nutrients by centrifuging. A further method was worked out for rapidly assessing the results of the tests by classifying the mass appearance of the germination of the conidia into five categories.

The results obtained in a number of tests with copper- and sulphur-containing inorganic substances and with certain organic compounds indicated that this method is reliable for comparing fungicides in the laboratory, but whether there is a correlation between laboratory and field-test results remains to be investigated. Comparisons showed that

the lowest effective concentration of lime-sulphur in the field (1 per cent.) is three times that of the lowest effective concentration (0·33 per cent. unwashed) in the laboratory, while that of Bordeaux mixture in the field (0·2 per cent. copper sulphate) is sixteen times the lowest effective concentration in the laboratory (0·0125 per cent.). It seems probable that with widely differing fungicides different ratios will be found between the results obtained in the laboratory and in the field. Of the organic compounds tested, 8-hydroxyquinoline, salicylanilide, tetramethylthiuram sulphide, and tetramethylthiuram disulphide [ibid., xvi, p. 765] showed promise, and the last-named was included in field tests in 1937.

Spassky (A. F.). Комбинированный дестомеситель-бонификатор. [A machine for preparation of dusts.]—*Pl. Prot., Leningr., 1937*, 15, pp. 86–89, 1 diag., 1937.

This is a description of a machine devised by the author for the preparation of dusts, and the mixing of fungicides with insecticides, fillers, and oils, which increase the adhesive capacity of dusts. The materials are fed from hoppers into compression chambers (actuated by a rotary compressor driven by an internal-combustion engine) from which they are forced as jets which impinge upon one another. The resulting mixture then passes through a series of devices which complete mixing and pulverization.

Ogilvie (L.) & Hickman (C. J.). **Cuprous oxide and zinc oxide as seed protectants.**—*Gdnrs' Chron.*, ciii, 2666, pp. 79–80, 2 figs., 1938.

Cuprous oxide was found to be a much more effective protectant of pea seeds in soil contaminated with *Pythium ultimum* [*R.A.M.*, xvi, p. 781], one of the agents of seedling damping-off, than zinc oxide [ibid., xvii, p. 219] in recent experiments at the Long Ashton Research Station. The percentages of emergence were: untreated 3·3, zinc oxide treated 17·7, cuprous oxide treated 71·6. In the early 1937 sowings, moreover, Variety Surprise and Early Bird pea seed dusted with cuprous oxide germinated much more extensively than the controls, the percentages for the former variety sown on 25th February and 11th March being, respectively, 31·8 and 64·8 for the treated and 8·2 and 26·4 for the untreated, while the corresponding figures for the latter were 61·2 and 66·6, respectively, for the dusted seed, and 23 and 31·4 for the controls. At the later sowing dates the differences were not so marked. Cuprous oxide further increased the emergence of lettuce (by nearly 50 per cent.), cabbage, tomato, and sugar beet, and zinc oxide that of lettuce (66 per cent.), cabbage, tomato and turnip, while both stimulated emergence in a number of widely grown ornamentals. Small quantities of seed may be shaken up with the chemical in a dry glass jar, but for larger amounts a rotating churn with baffle plates is preferable. One level teaspoonful of the disinfectant (2·5 per cent. by weight) per lb. of seed is the normal dosage, but for large seeds, e.g., peas and cucumber, only about 0·25 per cent. by weight should be used [cf. ibid., xvii, p. 332]. Zinc oxide is more difficult and takes longer to apply than cuprous oxide, only the finest grades adhering properly to the seeds.

SCHULTZ (H.). **Pflanzenschutz in Zahlen.** [Plant protection in figures.] —*Zbl. Bakt.*, Abt. 2, xcvii, 18–22, pp. 413–429, 1938.

Statistics are furnished of the estimated damage caused in Germany and other countries by plant diseases and insect pests in various branches of agriculture, horticulture, silviculture, viticulture, fruit- and vegetable-growing, subtropical, and tropical crops, and stored products [cf. *R.A.M.*, xiv, p. 461 *et passim*], together with notes on damage by frost and hail and a discussion of the profitability of plant-protective measures. A three-page bibliography is appended.

WELLMAN (F. L.). **Poverty of human requisites in relation to inhibition of plant diseases.**—*Science*, N.S., lxxxvii, 2247, pp. 64–65, 1938.

In certain districts of Turkey, where extreme poverty prevails among the population due to the shortage of natural resources, plant diseases were found to be virtually absent, the inference being that the agricultural practices thereby necessitated entail the rapid disposal of infected material, e.g., as fodder, and so prevent the accumulation and spread of pathogenic organisms.

FRIEDRICHSOHN (G. A.). Обзор вирусных заболеваний сельскохозяйственных растений Саратовской области. [The virus diseases of crop plants in the Saratov region.]—*Pl. Prot., Leningr., 1937*, 14, pp. 105–107, 1937.

In this list of virus diseases of potato, tomato, cucurbits, fruit trees, and raspberries, encountered in the Saratov region, tomato aucuba mosaic and a disease provisionally identified as bunchy top of tomato [*R.A.M.*, xv, p. 124] are reported for the first time from the U.S.S.R.

STANLEY (W. M.). **Virus proteins—a new group of macromolecules.**—*J. phys. Chem.*, xlii, 1, pp. 55–70, 1 fig., 4 graphs, 1938.

This is an interesting survey of recent advances in the study of virus proteins, with special reference to their inclusion in the field of colloid chemistry as a new group of macromolecules. Several virus proteins, some from plant and others from animal and bacterial diseases, some larger and some smaller than the relatively immense tobacco mosaic virus protein [*R.A.M.*, xvii, p. 272], have been isolated and are undergoing investigation in various laboratories. Since the virus proteins possess the reproductive capacity and other properties characteristic of living organisms, as well as molecular features, any attempt at the present juncture to relegate them to one or other of these groups would be premature pending further experimental data.

ENDRIGKEIT (A.). **Beiträge zum ernährungsphysiologischen Problem der Mykorrhiza unter besonderer Berücksichtigung des Baues und der Funktion der Wurzel- und Pilzmembranen.** [Contributions to the nutritional-physiological problem of mycorrhiza with special reference to the structure and function of the root and fungus membranes.]—*Bot. Arch.*, xxxix, 1, pp. 1–87, 16 figs., 1937. [English summary.]

A comprehensive discussion, supplemented by a three-page bibliography, is given of the writer's studies at Königsberg and elsewhere in

East Prussia, on the nutritional and physiological aspects of mycorrhiza, on the basis of which these structures are divided into two groups, viz., endotrophic, represented by Liliaceous mycorrhiza of the *Allium* type, and ectotrophic, exemplified by that of *Pinus* [*R.A.M.*, xvii, p. 126].

It was shown by physico-chemical investigations of the root and fungus membranes and permeability experiments that endotrophic mycorrhiza are isolated by the early decaying rhizodermis and intercutis [hypoderm], which become suberized. The mycorrhiza of this group examined (*A. suaveolens*, *Convallaria*, and *Maianthemum*) showed little or no capacity for the absorption of stains in comparison with the autotrophic roots of various plants. A full account is given of the mode of penetration and development of the inter- and intracellular endotrophic mycorrhiza of *Molinia coerulea*. The influence of the intercutis in mycorrhiza of the *Allium* type increases parallel with a decline in the number of transfusion cells, the pits of which may be observed in *A. suaveolens*. The mycelium, isolated by the intercutis, maintains a connexion with the exterior by means of infection hyphae.

The disappearance of starch from the cells of the above-mentioned plants and of *Rhamnus frangula* colonized by endotrophic mycorrhiza was shown to be a reaction of the host to fungal infection. Whereas in non-infested roots the starch is deposited indiscriminately, in those colonized by mycorrhiza it preponderates in the cells free from mycelium. The intracellular arbuscles cannot be interpreted as assimilatory organs, since they are digested as they are formed and show no indication of hyphal development from their terminal branches, but rather as proliferations induced by the growth-promoting stimuli of the cell sap. The results of the permeability tests point to the direct transference to the plant of the substances mobilized by the fungus. This is exemplified by the migration of pigments from the hyphae into the cell walls or protoplasts of the host cells. The assimilation of nutrients from the associated fungus mycelium is also explicable on the basis of the theory of the transmission of the negative pressure in the vessels to the root parenchyma.

This exchange mechanism is of definite importance in the nutritional-physiological function of the ectotrophic forest tree mycorrhiza. The assimilatory capacity of the roots has been found to depend on the fungus mantle and the development of the 'Hartig net', the mycelium alone providing a connexion with the exterior. Whereas in conifers, e.g., *P. sylvestris*, the intercellular mycelium encircles the entire primary bark, in deciduous trees, such as lime and oak, the 'Hartig net' is confined to the radially extending rhizoderm. The opinions recently expressed as to the endophytic character of the ectotrophic forest tree mycorrhiza find no support in the writer's investigations. Fungal virulence varies in some degree with the incidence of root infestation without in any way altering the intercellular character of the relationship. No nutritional or physiological significance can be attributed to the occasional observation of rudimentary intracellular infection or the common intensification of the 'Hartig net' on a decayed primary cortex.

Since the parasitic acquisition of nutrients by the fungus is of a very restricted order in both mycorrhizal groups, the higher plant is evidently the chief gainer by the association until the activity of the roots begins

to decrease with age, when the balance inclines in favour of the fungus. Comparative membrane and permeability observations on plants in a colonized and uncolonized condition revealed a progressive loss of independent assimilatory capacity of the roots with increasing fungal activity.

The permeability experiments on auto- and mycotrophic plants disclosed exceptions to the rules hitherto held to govern the infiltration capacity of stains. Infiltration into the roots is dependent, not only on the solubility and particle size of the stain, but also on the membrane substance and root mechanism, which influence the mobility, velocity of absorption, and path of diffusion of the colouring matter through the cell membranes.

Kögl (F.). **On plant growth hormones.**—*J. Soc. chem. Ind., Lond.*, lvii, 3, pp. 49–54, 3 diags., 2 graphs, 1938.

In connexion with a general review of recent developments in the utilization of plant growth hormones in medicine, chemistry, and botany, the writer briefly summarizes the results of his experiments (in collaboration with N. Fries) on the application of biotin, inositol, and aneurin as stimulants to fungal growth [*R.A.M.*, xvii, p. 196].

Davidson (W. D.). **Potato growing for seed purposes.**—236 pp., 63 pl. (1 col.), 1 fig., Dublin, Stationery Office, [1937]. Price 2*s.* 6*d.*

This comprehensive and well-illustrated publication, a further revised and greatly enlarged version of a pamphlet with the same title published in Eire in 1925 and (in a revised form) in 1931, is intended for commercial growers of seed potatoes. Every aspect of the subject is covered, including cultivation, inspection and certification, marketing, diseases (the section on which (pp. 32–106) has been entirely rewritten), the production of healthy stocks, and the identification of varieties.

McLean (J. G.). **Fusarium avenaceum, a vascular parasite of Potato.**—Abs. in *Phytopathology*, xxviii, 1, p. 16, 1938.

Fusarium avenaceum, first observed on potatoes in Wisconsin in 1936 and since collected throughout the State, penetrates the roots and causes seed-piece decay. The tuber symptoms resemble those due to the more common wilts, *F. solani* var. *eumartii* and *F. oxysporum* [*R.A.M.*, xvi, p. 489], but the aerial organs of the plants are differently affected. There is a reduction of leaf area caused by the decrease in size of the leaflets on the apical leaves and an increase in the number of folioles. The axillary buds are stimulated to form secondary shoots or aerial tubers. Chlorosis and tipburn are typical, accompanied by stem and petiole rigidity. The leaves roll upwards and acquire a rough texture, while reddening or purpling of the tops is fairly common. The Cobbler, Triumph, Katahdin, and Rural varieties are susceptible to *F. avenaceum*, whereas early sorts tend to escape infection.

Spraing, internal rust spot, and net necrosis of the Potato tuber.—*Adv. Leafl. Minist. Agric. Fish., Lond.*, 290, 4 pp., 3 figs., 1938.

Spraing of potato [*R.A.M.*, xiii, p. 649; xvi, p. 514], which is not very common in England, is stated to occur on the Continent, especially in Holland, where the name 'concentric necrosis' has been suggested

for it [ibid., xiv, p. 253]; it has not been reported from other parts of the world. The evidence indicates that it may be a virus disease, contracted from the soil.

A special form of internal rust spot [ibid., xvi, p. 400], or possibly a different disease altogether, occurs in certain localities. In this form the spots may be scarcely perceptible at lifting, but develop subsequently, and often break down, with the result that cavities are formed and the tuber frequently decays.

Net necrosis [loc. cit.] is uncommon in Britain, but has recently become important in Scotland in Golden Wonder potatoes.

Ehrke [G.]. **Zur Eisenfleckigkeit der Kartoffeln. Wie verhalten sich eisenfleckige Kartoffeln im Winterlager und in welchem Masse wird der Pflanzgutwert der Kartoffeln herabgesetzt?** [On Potato 'Eisenfleckigkeit'. How do 'eisenfleckig' Potatoes behave in winter storage and in what degree is the value of the Potatoes for seed impaired?]—*Dtsch. landw. Pr.*, lxv, 2, pp. 15–16, 5 figs., 1938.

Except in extreme cases of the form of potato 'Eisenfleckigkeit' [*R.A.M.*, xv, p. 250; xvii, p. 198] known as 'Pfropfenbildung' [ibid., x, p. 746], there appears from the writer's experiments at Dahlem, Berlin, with the Sickingen, Rosafolia, and Erdgold varieties to be no risk either of an increase of the disorder itself or of the development of fungal or bacterial rots in affected material during winter storage. Tests with severely diseased Goldfink tubers further showed that the initial slight reduction of germination is purely temporary, and that the disease is not transmissible to the progeny in any of its various manifestations. The 'scattered' form of Eisenfleckigkeit seems from protracted observations to be restricted to certain soils in which a layer of mild humus is superimposed on gravel with a deep ground-water surface or on clay, and to occur only under a particular set of meteorological conditions.

Wenzl (H.). **Zur Histogenese der Braunmarkigkeit und Hohlherzigkeit der Kartoffelknollen.** [On the histogenesis of medullary browning and hollow heart of Potato tubers.]—*Phytopath. Z.*, x, 6, pp. 594–605, 6 figs., 1937.

A detailed account is given of the author's histological studies on the disorder of Böhm's Allerfrüheste Gelbe potato described by Rothmaler in Austria as heart necrosis [*R.A.M.*, xi, p. 534] for which the name medullary browning is preferred, hollow heart being the final development of the disorder. The material studied was obtained from a small plot of this variety growing on a light sandy soil at the Plant Protection Institute, Vienna. Of the 431 tubers examined, 32 per cent. showed marked symptoms of either medullary browning or hollow heart and a further 9 per cent. were mildly affected by the former. As remarked by previous workers, large tubers sustained heavier damage than those in the lighter weight classes (87·5 per cent. in the group weighing over 131 gm. as compared with 7 per cent. in the 20 to 30 gm. lot). Nearly 25 per cent. of the small tubers (30 to 50 gm.), however, were necrotic in the heart region, though otherwise perfectly sound.

As a result of his studies the author concludes that medullary browning and hollow heart in Böhm's Allerfrüheste Gelbe potatoes arise in consequence of enzymatic disorders manifested in the first place by starch breakdown and later by the death of individual cells or cell groups. No essential connexion could be detected between the rupture of cells or abnormalities in intercellular space formation and the above-mentioned cellular necrosis, the attribution of which to 'histological tensions' is unacceptable. Such 'tensions' are only expressed, after the isolation of the necrotic area by a cork layer subsequently forming the wall of the cavity, in a rupture of the dead tissue or detachment of the newly erected cork wall, and are in any case not the cause, but the result of heart necrosis.

BLACK (L. M.). **A study of Potato yellow dwarf in New York.**—*Mem. Cornell agric. Exp. Sta.* 209, 23 pp., 4 pl., 2 maps, 1937.

After stating that potato yellow dwarf [*R.A.M.*, xv, p. 42; xvii, p. 132] has in recent years caused serious loss to the certified seed-potato industry in New York, the author describes how in the acute stage flowers are rarely present, the top of the plant being killed before blossoms develop. The symptoms of this stage on an inflorescence include dwarfing of all the parts, failure of the flowers to open, water-soaked zones on the petals, and necrosis of the petals and sepals. In the chronic stage, vines from badly affected tubers are dwarfed and spindling. The chronic stage is not usual on plants in the field, but inoculated plants grown at 27° to 33° C. in the greenhouse generally show the acute symptoms in the primary axis, and the chronic symptoms in the axillary branches that develop afterwards. This new growth quickly outgrows its initial tendency to form rosettes of leaves. The apical meristem continues to grow, instead of dying, as in the acute stage. Dwarfed leaves showing vein-clearing and mild mottle are produced, whereas in the acute stage the uppermost leaves turn yellow and die. The internal apical necrosis characteristic of the beginning of the disease may be almost unnoticeable in the chronic stage, in which a short, superficial, depressed streak is generally present instead, directly below the leaf axils on the lower part of the stem, and often extending along the lower surface of the petiole; later, the affected leaves die and fall off. The tubers show less necrotic spotting than in the first stage. The change from the acute to the chronic stage is a regular process in the development of the disease, and is not caused by special environmental conditions inducing masking. Infected plants grown for five vegetative generations showed no further improvement, a state of equilibrium having, apparently, been reached between virus and plant. Scions from plants in the chronic stage induced symptoms of the acute stage on grafted test plants, indicating that the virus is present in plants in the chronic stage but that its pathogenic activity has become reduced as a result of some change in the plants.

Transmission tests with *Myzus persicae* all gave negative results, two shipments of the Wisconsin collection of *M. persicae* used by Koch (1934) also failing to transmit the virus [ibid., xiv, p. 190]. The evidence obtained further indicated that *Empoasca fabae*, *Macrosiphum solanifolii* [ibid., xv, p. 43], *M. pseudosolani*, *Deltocephalus inimicus*,

Phenacoccus gossypii, *Pseudococcus citri*, *Lygus pratensis*, and the potato flea-beetle [*Epitrix cucumeris*] are not vectors. The clover leaf-hopper (*Aceratagallia sanguinolenta*) [loc. cit.], on the other hand, was proved to transmit the virus. This insect, which occurs throughout the United States, except on the Pacific slope, is found in potato fields from the emergence of the sprouts until the death of the vines. It can overwinter the virus in its body, and may be viruliferous at any season.

Trifolium pratense, *T. hybridum*, *T. repens*, and *T. agrarium* are susceptible to the disease, the first-named probably being an important source of the virus, which was also transferred to 17 potato seedling varieties raised by the United States Department of Agriculture and 6 wild species of potato, as well as Marglobe tomatoes, *Physalis heterophylla*, and *Hyoscyamus niger*.

Seed-potato plots should be isolated both from diseased clover and diseased potatoes, and tubers from fields where new infections have developed at the edges in August should be tested before being used for seed by growing or slicing a sample to ascertain the extent of infection. Roguing was unavailing where spread was taking place rapidly, and precautions against spread from the cutting knife were found to be unnecessary. No control results from selecting either large or small potatoes for planting.

Walker (J. C.) & Larson (R. H.). **Soil temperature in relation to Potato yellow dwarf.**—Abs. in *Phytopathology*, xxviii, 1, p. 21, 1938.

Epidemics of potato yellow dwarf [see preceding abstract] in central Wisconsin have been characterized by poor stands rather than high percentages of plants with systemic symptoms. The major crop is often exposed to high temperatures in the light, sandy local soils during and immediately after planting in the first half of June. Experiments were conducted in soil held at constant temperatures of 16°, 20°, 24°, and 28° C., with a common atmospheric temperature of 20° to 22°, infected tubers being cut into four pieces and one piece planted at each temperature. At 16° germination and development were normal, at 20° emergence was normal, but the plants were slightly dwarfed, at 24° emergence was reduced and severe symptoms developed, while at 28° there was practically no emergence. Seed pieces in non-emerging hills usually remain firm for several weeks, often until the harvest, and even later they commonly germinate normally in cool soil.

Matzulevitch (B. P.) & Verevitcheva (Mme L. V.). Оценка серологического метода в определении зараженности клубней Картофеля вирусами. [The serological method as a means of determining the infection of Potato tubers by virus diseases.]—*Pl. Prot., Leningr.*, *1937*, 14, pp. 91–95, 1937.

The authors compare the biological and serological methods of determination of infection of potato tubers with rugose and streak mosaics [*R.A.M.*, xvii, p. 126] in the following experiments. One half of the material, consisting of diseased and healthy specimens from the Kruger [President], Great Scot, Lorch, Seyanetz, Waltman, Deodara, Epicure, Triumph, SAS, and Orig. Gisevius potato varieties, was planted and observed in hothouses; the other half was reserved for

serological analysis. Antigens were prepared from both diseased and healthy tubers, and were used undiluted for the precipitation reactions. The antiserum of the rugose mosaic virus had a titre of 1:2,500, and that of the streak mosaic virus 1:12,800. The control serum was obtained from rabbits inoculated with the sap of healthy potato tubers and was used in the following dilutions: 1:20, 1:40, 1:80, 1:160, 1:320, 1:640, and 1:1,280. The comparison of the two methods showed an agreement of 81·5 per cent. in results with the rugose mosaic virus and 85 per cent. in those with streak mosaic. The serological method being the quicker of the two can be recommended as supplementary to the biological. It has also the advantage of being independent of the growing season.

Clark (C. F.). **Recent developments in Potato breeding: review of literature.**—*Amer. Potato J.*, xv, 1, pp. 16–22, 24, 1938.

Most of the papers cited in this survey relating to the phytopathological aspects of potato breeding (1936–7) have been noticed from time to time in this *Review*, but the following item may be mentioned. Studies by E. K. Emme in the U.S.S.R. (*Biol. Zh.*, v, p. 901, 1936) showed that all the triploid hybrids derived from crosses between *Solanum rybinii* and (*a*) two varieties of *S. antipoviczii* (*grandarae* and *reddickii*) and (*b*) *S. ajuscoense* var. *candelarianum*, all having haploid chromosome numbers of 24, were resistant to late blight (*Phytophthora infestans*) and virus diseases [*R.A.M.*, xvii, pp. 131, 200, 267].

Böning (K.) & Wallner (F.). **Beobachtungen und Versuche zur Frage der Widerstandsfähigkeit der Kartoffelsorten gegen Schorf.** [Observations and experiments in connexion with the problem of varietal resistance of Potatoes to scab.]—*Prakt. Bl. Pflanzenb.*, xv, 8–9, pp. 268–279, 2 figs., 1938.

Of a number of German potato varieties reputedly immune from scab (*Actinomyces*) [*scabies*] or more or less resistant to the disease [*R.A.M.*, xvii, pp. 132, 198], grown from 1935 to 1937 in quadruplicate test plots in various types of sandy soil where infection is particularly prevalent in Bavaria, only Jubel, with the possible additions of Treff As and Edelragis, gave moderately satisfactory results in this respect under local conditions. Realizing that the varietal susceptibility data obtained in one district are not necessarily applicable to other parts of the country, the writers suggest that scab reaction trials should be conducted in different localities throughout Germany. In a test at Donaumoos in 1936, Flava, Erdgold, Treff As, Parnassia, Ackersegen, Altgold, Voran, and Mittelfrühe were much more resistant than Allerfrüheste Gelbe, Goldwährung, Industrie, Ovalgelbe, and Goldgelbe.

The incidence of potato scab depends largely on the weather, and was much higher in the exceptionally dry summers of 1935 and 1937 than in 1936. The disease generally predominates on light sandy soils, but anomalous results were obtained in some of the tests to determine the influence of soil constitution on scab development, which was unexpectedly abundant, for instance, on certain moorland soils with a strongly alkaline reaction (P_H 7·5 to 8).

Opinions differ as to the relative importance of the several *A.* strains

implicated in the disease and of specific varietal tendencies in the production of flat or protuberant scab. In the writers' tests, the same variety under exactly comparable conditions may exhibit both forms, while other varieties develop exclusively one or the other type on different soils.

In 1936 powdery scab (*Spongospora subterranea*) [ibid., xvi, p. 274] assumed such a virulent form, especially on the Aal, Ackersegen, Erdgold, Robinia, and Treff As varieties, that common scab attracted no attention. A degree of control was achieved in tests with the relatively resistant Parnassia by the incorporation with the ordinary fertilizer of sulphur dust at the rate of 400 kg. per hect., which reduced the incidence of infection from 26 to 17 per cent.

MOORE (A.). **Rubber-growing: elementary principles and practice.**—*Plant. Manual Rubb. Res. Inst. Malaya* 7, 82 pp., 24 pl., 3 figs., 3 diags., 1938.

This manual includes several chapters (pp. 49–74) on the symptoms and control of fungous diseases of rubber (*Hevea brasiliensis*). There is also a chapter on disinfectants and fungicides.

SCHWEIZER (J.). **Over een physiologische theorie van de bruine binnenbast-ziekte bij Hevea brasiliensis.** [On a physiological theory of the brown bast disease of *Hevea brasiliensis*.]—*Bergcultures*, xii, 2, pp. 31–39, 2 graphs, 1938.

Chemical analyses have shown that the latex of brown bast-diseased rubber trees in Java [*R.A.M.*, xvii, p. 343] has an abnormally high ash and low nitrogen content in comparison with healthy material, whence it may be inferred that in the former case the rubber globules have assimilated less albumin and more mineral constituents than in the latter. From a colloid-chemical standpoint the normal lyophilia of the latex has been converted into lyophobia. The latex of diseased trees shows a very pronounced tendency to self-coagulation in a glass cylinder. The composition of the latex of affected trees was further shown to be completely altered, the rubber concentration having sunk to less than half, whereas the cations, especially magnesium, were increased, and calcium was virtually absent. These results indicate that a partial loss of semi-permeability of the cell wall, which normally allows the passage of water while retaining salts and other dissolved substances, is involved in the development of the disease.

BEELEY (F.). **Oidium heveae. Report on the 1937 outbreak of Hevea leaf mildew.**—*J. Rubb. Res. Inst. Malaya*, viii, 2, pp. 140–148, 1 graph, 1938.

The general improvement in foliage of *Hevea* rubber trees recorded in the previous year's report [*R.A.M.*, xvi, p. 61] was maintained in 1937 in Malaya generally, with the exception of the central part of Selangor. Dry weather at the end of 1936 and the beginning of 1937 created conditions unfavourable to an epidemic of mildew (*Oidium heveae*). The sulphur-dusting programmes were reduced to one or two rounds of dusting or omitted altogether. Sulphur-dusting is gaining in

popularity and will, no doubt, soon be considered an essential method of control against *O. heveae* and other leaf parasites.

HANSFORD (C. G.). **Annotated host list of Uganda parasitic fungi and plant diseases. Part V.**—*E. Afr. agric. J.*, iii, 4, pp. 319–324, 1938.

This further contribution to the author's list of parasitic fungi and plant diseases in Uganda [*R.A.M.*, xvii, p. 345] comprises diseases of 16 families of plant hosts and also of insects and nematodes.

HANSFORD (C. G.). **Contributions towards the fungus flora of Uganda. I. The Meliolineae of Uganda.**—*J. linn. Soc.* (*Bot.*), li, 339, pp. 265–284, 1937.

This is a critically annotated list of 68 Meliolineae collected by the author in Uganda, including 35 new species and 5 new varieties [with Latin diagnoses] erected in part in collaboration with the late F. L. Stevens.

UNAMUNO (L. M.). **Notas micológicas. XIII. Nuevos datos para el estudio de los hongos imperfectos de la flora española.** [New data for the study of the fungi imperfecti of the Spanish flora.]—*Bol. Soc. esp. Hist. nat.*, xxxvii, 1–6, pp. 65–77, 7 figs., 1937. [Received April, 1938.]

In continuation of his geographical and taxonomic studies on the Spanish mycoflora [*R.A.M.*, xv, p. 529], the writer gives an annotated list of 36 fungi imperfecti from various parts of the country.

ARWIDSSON (T.). **Über Asterocytis, Astrocystis und Asterocystis.** [On *Asterocytis*, *Astrocystis*, and *Asterocystis*.]—*Bot. Notiser, 1938*, 1–3, pp. 190–192, 1938.

Confusion having arisen between the genera *Asterocytis*, *Astrocystis*, and *Asterocystis*, the writer elucidates the position as follows. *Asterocytis* Gobi is a genus of algae; *Astrocystis* B. & Br. (Sphaeriaceae) and *Asterocystis* de Wildem. (Oomycetes) are merely orthographic variants of the same name, one of which, according to article 40 of the Rules of Botanical Nomenclature, must be discarded. In the case in point, *Astrocystis*, dating from 1873, obviously takes precedence of *Asterocystis* (1894), which should be replaced by *Olpidiaster* Pascher 1917 (*Beih. bot. Zbl.*, xxxv, p. 578) [but see *R.A.M.*, xvi, p. 775].

BOEDIJN (K. B.). **A smut causing galls on the leaves of Hypolytrum.**—*Bull. Jard. bot. Buitenz.*, Sér. 3, xiv, 3–4, pp. 368–372, 2 figs., 1937.

Latin and English diagnoses are given of *Cintractiella lamii* Boedijn n.g., n.sp., found parasitizing the leaves of *Hypolytrum* sp. (Cyperaceae) in New Guinea in 1920. On the under side of the leaves are formed bundles of flattened, straight, or slightly curved shoots, ½ to 2 cm. by 1 to 1½ mm., consisting of a short stem entirely covered with pale green, scale-like leaves, from the apices of which project hard, black, cylindrical sori, 8 to 12 by ½ to ¾ mm., composed of agglutinated spores and enveloped by a thin layer of hyaline hyphae; the globose, thick-walled, brown, reticulate spores measure 29 to 36 μ in diameter and are

furnished with germ pores 2 to 3 μ long. The intercellular mycelium is provided with numerous coiled, lobed, often branched haustoria.

Cintractiella resembles *Cintractia* in its agglutinated spores and in its parasitizing a member of the Cyperaceae, but differs from it in its formation of peculiar galls and in its large spores with germ pores.

Van der Meer Mohr (J. C.). **Verslag van het Deli Proefstation over het jaar 1936.** [Report of the Deli Experiment Station for the year 1936.]—*Meded. Deli-Proefst.*, Ser. 2, xlvii, 51 pp., 1 diag., 1937.

The following items of phytopathological interest occur in the botanical (H. G. van der Weij) and agricultural (J. van der Poel) sections of this report [cf. *R.A.M.*, xv, p. 686]. The form of tobacco mosaic known as 'daon lidah' assumed a great variety of aspects in 1936, including the development of tongue-shaped leaves, with and without mottling; mottling in only some of the leaves of a plant; stunted growth and a reduction of the entire leaf surface, verging in extreme cases on the 'cabbage-tobacco' type; the foregoing symptoms combined with mosaic; necrotic leaf spots of various shapes; and transitional stages approximating to certain forms of 'gilah' or 'kroepoek' [identical in part with leaf curl: ibid., xvii, p. 75].

A number of *Nicotiana triplex* plants raised from seed in connexion with a cytological investigation showed some degree of resistance to leaf spot [*Cercospora nicotianae*: ibid., xvi, p. 414] in comparison with other Deli selections.

Full details are given of the progress of an extensive series of experiments in the control of slime disease [*Bacterium solanacearum*: ibid., xvi, p. 780] by various fertilizers.

Holmes (F. O.). **Taxonomic relationships of plants susceptible to infection by Tobacco-mosaic virus.**—*Phytopathology*, xxviii, 1, pp. 58–66, 1 diag., 1938.

Of 73 species of herbaceous dicotyledons tested for their reaction to tobacco mosaic at the Rockefeller Institute for Medical Research, Princeton, New Jersey, 46 proved susceptible to infection by the virus, which was shown to increase in inoculated leaves by quantitative subinoculation tests and observation of symptoms at the site of inoculation. The results showed that a correlation appears to exist between susceptibility to mosaic and the conventional system of taxonomic classification, since nearly all the tested plants in one group of 11 families lacked the capacity to support increase of the virus, which was tolerated, on the other hand, by 95 per cent. of the species in another group of 14 families.

Thornberry (H. H.). **Crystallization of Tobacco-mosaic virus protein.**—*Science*, N.S., lxxxvii, 2248, pp. 91–92, 1938.

The writer describes in detail a method for the crystallization of tobacco mosaic protein involving the heating of the macerated frozen tissue to 40° C., adjusting the reaction to about P_H 7 by adding disodium phosphate, and clarifying the juice by filtration. Further crystallization is effected by adjusting the reaction to P_H 4·5 with acetic

or sulphuric acid, salting out with ammonium sulphate, and storage at 0° to 5° C. overnight.

FRANKE (H. M.). **Toxisches Agens und lokale Resistenz beim klassischen Tabak-Mosaik-Virus.** [The toxic principle and local resistance in the ordinary Tobacco mosaic virus.]—*Planta*, xxvii, 4, pp. 392–398, 4 figs., 1937.

Local resistance to the ordinary tobacco mosaic virus in *Nicotiana glutinosa* and *Datura stramonium* [*R.A.M.*, xvii, p. 272] was found to be associated with the possession of specific 'immunity buffer systems', the reaction of which to the virus leads to the elaboration at the site of infection of toxic, necrosis-inducing principles. By grafting susceptible plants (tomato and tobacco) on locally resistant individuals, the immunity principles are transferred to the susceptible scions, which subsequently react to infection by the production of local necroses. The virus inactivation accompanying the necrosis induced by the reaction of the immunity principles represents a specific defensive mechanism in the locally resistant plants.

HOLMES (F. O.). **Strain of Tobacco resistant to Tobacco mosaic.**—Abs. in *Phytopathology*, xxviii, 1, p. 9, 1938.

A dominant gene, inducing a necrotic type of reaction to infection by the tobacco mosaic virus [*R.A.M.*, xvii, p. 349; and next abstract] was transferred from *Nicotiana glutinosa* to *N. tabacum* by intermediate crossing with the amphidiploid species *N. digluta*. After hybridization, successive back-crosses to *N. tabacum*, combined with the selection of necrotic-type individuals, produced *tabacum*-like plants, which responded to infection by symptoms typical of *N. glutinosa*. Repeated self-pollinations gave rise to wholly necrotic-type strains of tobacco. The presence of the gene conferring the necrotic type of reaction makes the transfer of virus from diseased plants more difficult, and it is thought that the infective principle will be unable to survive in the field in tobacco plants containing this gene.

NOLLA (J. A. B.). **Inheritance in Nicotiana. III. A study of the character for mosaic resistance in Nicotiana tabacum L.**—*J. Hered.*, xxix, 1, pp. 43–48, 3 figs., 1938.

In continuation of previous studies on the inheritance of mosaic resistance in tobacco [*R.A.M.*, xiv, p. 660, and preceding abstract] the author discusses the results obtained from crossing the mosaic (Johnson's tobacco virus 1)-resistant Ambalema variety of *Nicotiana tabacum* with some susceptible varieties, such as Turkish (Samsun) (T), White Virginia No. 9, and No. 144–9–1, a line resistant to *Phytophthora* [*parasitica nicotianae*] isolated from the cross Cuban × Turkish. The behaviour of the F_1 generation of the direct and reciprocal cross Ambalema × Turkish indicated that susceptibility to tobacco mosaic is dominant over resistance. The results in the F_2 and F_3 generations of various other crosses, with back-crosses to Ambalema, show that duplicate factors are involved, recessiveness of the two factors producing resistance to mosaic whereas susceptibility results when either factor or both are dominant. The evidence from F_2, F_3, and back-cross generations

indicates that there is a 15 to 1 ratio of susceptibility to resistance in the progeny of the Ambalema × Turkish cross.

CLAYTON (E. E.), SMITH (H. H.), & FOSTER (H. H.). **Mosaic resistance in Nicotiana tabacum.**—Abs. in *Phytopathology*, xxviii, 1, p. 5, 1938.

Tobacco seed collections from Mexico and Central and South America were tested for resistance to common mosaic [see preceding abstracts]. Of the 897 lots examined, 36 proved to be resistant, all from Colombia, South America. Included in this group were a number of varieties quite distinct from Ambalema. The resistant collections fell into two categories, the highly resistant showing from none to many localized pale green spots, and the moderately resistant exhibiting mild systemic mottling. The resistance reaction of the former group (which includes Ambalema) was found to be conditioned by two major recessive factors, possibly subject to some degree of modification by other factors.

ALLISON (C. C.). **Physiologic specialization of Thielaviopsis basicola on Tobacco.**—Abs. in *Phytopathology*, xxviii, 1, p. 1, 1938.

Four distinct physiologic races of *Thielaviopsis basicola* were differentiated on the basis of their pathogenicity to the four tobacco varieties Special 400, Kentucky Nos. 5 and 16, and Harrow's Velvet [*R.A.M.*, xvi, p. 637] sown in plots on artificially infected soil. Kentucky 5 was moderately susceptible to race 1, to which the other varieties were resistant; Kentucky 5 and Special 400 were moderately susceptible to race 2, Kentucky 16 and Harrow's Velvet being resistant. Kentucky 5 and Special 400 were susceptible, Kentucky 16 fairly so, and Harrow's Velvet resistant to race 3. Harrow's Velvet was moderately susceptible to race 4, which severely attacked the other three varieties. Races 1 and 2 were isolated from black root rot material obtained from Tennessee and North Carolina, 3 from plants originating in Tennessee and Washington, D.C., and 4 from specimens sent from Wisconsin and Canada.

GRAMPOLOFF (A. V.). **L'action des rayons ultra-violets sur l'entreposage des denrées périssables.** [The action of ultra-violet rays on perishable commodities in storage.]—*Annu. agric. Suisse*, li, 10, pp. 1130–1158, 1 col. pl., 5 figs., 11 graphs, 1937. [German summary.]

Further experiments at Wädenswil, Switzerland, on the control of storage rots of tomatoes (Tuckswood, Ailsa Craig, and Westlandia) of local and Canary origin by daily discontinuous (1 min. 10 secs. to 2 min. 54 secs.) and continuous (5 to 10 min.) exposure to ultra-violet irradiation [*R.A.M.*, xvi, p. 135] gave moderately satisfactory results at 4° and 8° C. (15° in the case of green fruit). The process effected a general reduction in the extent of the losses due to decay, though certain fungi offered considerable resistance to penetration by the rays, mycelial growth in the interior of the fruits being particularly difficult to suppress. The fungi principally involved in the decay of the Swiss material at 0° C. and 85 per cent. relative humidity were *Botrytis cinerea* and *Cladosporium lycopersici*, green fruits at higher temperatures being chiefly attacked by *Macrosporium* [*Alternaria*] *tomato*. The Canary tomatoes were infected by *A.* sp., *Phoma destructiva*, *B. cinerea*, *Penicil-*

lium glaucum, *Fusarium erubescens* [*F. scirpi* var. *acuminatum*: ibid., xvi, p. 323; xvii, p. 154], and occasionally by *C. lycopersici*. The flavour of the fruits was not impaired by irradiation, which did, however, impede the natural spread of the red coloration. The daily cost of the treatment (2 min. 54 secs. for each tomato) is estimated at fr. 0·15 per 100 kg., the corresponding figure for 10 minutes' irradiation being fr. 0·51 per 100 kg.

YOUNG (P. A.) & TAUBENHAUS (J. J.). **Weighted percentages of resistance of Tomato varieties to Fusarium lycopersici.**—Abs. in *Phytopathology*, xxviii, 1, pp. 22–23, 1938.

In extensive field tests of the reaction of tomato varieties to wilt (*Fusarium* [*bulbigenum* var.] *lycopersici*) [*R.A.M.*, xvii, p. 354] under epidemic conditions, 70 to 91 per cent. resistance was manifested by Sureset Forcing, Michigan State, Marglobe, Rutgers, Guba's crosses 421 and 424, Marvel, Blair Forcing, Louisiana Red, Kanora, Buckeye State, Marvana, Marglobe 75, Norduke, Louisiana Pink, and Marglobe 63. A number of varieties of low and intermediate resistance are also listed.

ALEXANDER (L. J.). **A new Tomato variety resistant to leaf mold.**—Abs. in *Phytopathology*, xxviii, 1, p. 1, 1938.

The new tomato variety, Globelle, resistant to leaf mould [*Cladosporium fulvum*: *R.A.M.*, xv, p. 470] is the result of a breeding programme carried through 14 generations since its inception in 1930. The parents of the original cross were Globe and Red Currant (*Lycopersicum pimpinellifolium*). Four additional crosses to the type varieties, Globe and Marhio, were necessary, and six generations have elapsed since the last cross. The growth habits of Globelle generally resemble those of Globe, but the quality of the fruit is superior. What appeared to be a semi-lethal factor was observed in the F_2 generation of the original cross and subsequently shown to be linked with the Cf_{p1} resistant factor, between which and small fruit size linkage was also established. In 1937 occasional leaf mould lesions were detected on heavily fruiting plants even of resistant lines, while Globe in the same test was almost completely defoliated and consequently produced small, low-grade fruits.

SPAULDING (P.). **A suggested method of converting some heavily Nectria-cankered hardwood stands of northern New England to soft-woods.**—*J. For.*, xxxvi, 1, p. 72, 1938.

Nectria canker is stated to be so destructive in numerous hardwood pole forest areas of northern New England that partial or complete conversion to softwoods appears to be the sole method of improving such stands for timber production. The following line of approach to the problem is suggested: (1) the release of properly spaced trees in the natural softwood reproduction already on the ground; (2) planting groups of 50 or more four-year-old red [*Picea rubra*], white [*P. glauca*], or Norway spruce [*P. abies*] at intervals where natural regeneration is lacking. About 25 years from the inception of these measures natural seeding should be in progress over the entire area concerned.

Schmidt (R.). **Mischpflanzung als Schädlingsbekämpfungsmittel.** [Mixed planting as a measure for disease control.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 3, pp. 32, 1 fig., 1938.

In connexion with the recommendation of mixed plantings as a measure of disease control in herbaceous cultures [see above, p. 398], attention is drawn to the benefits that have already been derived from a similar course in tree nurseries in Germany. The alternation of pyramid poplars [*Populus pyramidalis*] with weeping willows [*Salix babylonica*] has largely eliminated the prevalent willow scab [*Physalospora miyabeana*: *R.A.M.*, xv, p. 74], the spores of which presumably become lodged in the dense poplar foliage. The growth habit of both trees is also improved by the association.

Miller (P. W.). **Studies on Walnut blight and its control in Oregon: seventh report of progress.**—*Rep. Ore. St. hort. Soc., 1937*, pp. 119–143, 1938.

In further spraying tests against walnut blight [*Bacterium juglandis*: *R.A.M.*, xvi, p. 425] carried out in Oregon in 1937, when the disease was moderately severe as a result of prolonged rains during the critical period of infection, almost as good control was given by Bordeaux mixture 2–2–50, 2–1–50, and 2–½–50, as by the 4–2–50 and 4–4–50 concentrations, though a concentration of 8–5–50 gave the best results. Foliage injury was generally reduced to an insignificant amount by the addition of fish or mineral oils or oil emulsions, and mixtures made with dolomitic or high-magnesium lime were less injurious than those made with high-calcium lime. Injury diminished with decreasing amounts of lime until the neutral point was reached. Preliminary studies indicated that Bordeaux mixture has less effect on the transpiration of walnut leaves than on that of some other plants. Copper oxalate (2–50) was at least as effective as Bordeaux mixture (2–1–50) and caused no perceptible foliage injury, while copper oxychloride (containing 40 per cent. metallic copper, and used at the rate of 2 in 50) was nearly as effective, and also caused no leaf injury.

Miller (P. W.) & Schuster (C. E.). **The causes and prevention of tree losses in young Filbert orchards.**—*Rep. Ore. St. hort. Soc., 1937*, pp. 191–196, 1938.

There is much evidence indicating that in Oregon and its vicinity young filbert trees [*Corylus avellana*] are predisposed to attack by the bacterial blight due to an organism very closely resembling *Phytomonas* [*Bacterium*] *juglandis* [see preceding abstract] by unfavourable factors such as winter injury, drought, and improper drainage. The trees should be sprayed with Bordeaux mixture (4–2–50) about the middle of August to prevent infection of the buds during the ensuing winter. Suckering and pruning should be deferred until late spring or early summer, when the critical period for infection is largely over, as wounds made in winter and early spring do not heal readily, and the bacteria may effect entry through them. Tools should be sterilized after use on each tree, especially when pruning and suckering trees two to four years old, infections in the trunks of which frequently result in fatal girdling.

Jenkins (Anna E.) & Bitancourt (A. A.). **An Elsinoe causing an anthracnose on Hicoria pecan.**—*Phytopathology*, xxviii, 1, pp. 75–78, 2 figs., 1938.

English and Latin diagnoses are given of *Elsinoe randii* n.sp., the causal organism of pecan anthracnose in São Paulo, Brazil. The fungus produces cinereous areas, sometimes purplish- to black-edged, on the upper leaf surfaces, and round or irregular spots, 0·5 to 5 mm. in diameter, outlining the midrib and veins or occupying the interveinal regions of the leaflet. The epiphyllous, round, oval, or irregular, pulvinate, dark brown to black ascomata, 80 to 200 μ in breadth, 50 to 120 μ in thickness, with hyaline, light brown pseudoparenchyma contain scattered or crowded, embedded, globose to ovate asci 14 to 21 μ in diameter, with 4 to 8 hyaline, triseptate ascospores, 6 to 8 by 11 to 16 μ. The imperfect (*Sphaceloma*) stage is characterized by round or irregular, yellow, brown, or black acervuli, up to between 50 and 150 μ in diameter, dark, densely aggregated conidiophores, 15 to 50 μ in thickness, and hyaline, continuous or uniseptate conidia, 8 to 15 by 4 to 5 μ (in culture).

Bramble (W. C.). **Effect of Endothia parasitica on conduction.**—*Amer. J. Bot.*, xxv, 1, pp. 61–65, 1 fig., 2 graphs, 1937.

Experimental evidence showed that in chestnut stems from sprouts and seedlings artificially inoculated with *Endothia parasitica* [*R.A.M.*, xvi, p. 730] complete stoppage of water conduction occurs before the death of the foliage. This stoppage was noted only in those portions that bore bark lesions. The direct cause of the stoppage is considered to be most probably an abnormal formation of tyloses in the sapwood, which block the passage of water through the stem. Such mechanical blocking is regarded as the chief cause of the wilting and drying-up of leaves on infected chestnut stems.

Vines (A. E.) & Campbell (A. H.). **A physiological effect of Lophodermium macrosporum on the needles of Picea excelsa.**—*Rep. Brit. Ass., 1937*, p. 423, 1937.

Spruce needles infected by *Lophodermium macrosporum* [*R.A.M.*, xv, p. 411] are not readily detachable even after the shoot has been cut from the tree for several months, denoting an interruption in the functioning of the abscission mechanism situated between the needle and the peg. The operation of this mechanism has been shown to be dependent upon considerable and rapid loss of water from the needle, which is prevented, in the case of infection by *L. macrosporum*, by the thick, black zone of fungal cells surrounding the base and the mycelial aggregations (sclerotia) occluding the stomata.

Rayner (M. C[heveley]). **The mycorrhizal habit in Pinus: a comment.**—*Forestry*, xi, 2, pp. 117–121, 1937.

In this critical discussion of Hatch's recent paper on ectotrophic mycorrhiza [*R.A.M.*, xvii, p. 126], with special reference to her own work on the subject [ibid., xv, p. 737], the author points out that Hatch does not clearly define his views on the nitrogen theory. There is, for instance, some doubt as to whether the greater acquisition of nitrogen by the mycorrhizal seedlings in Hatch's prairie soil experiment is related

solely with the more efficient absorption of nitrates, and his claim that peptone and nucleic acid can be absorbed directly by the roots of pine seedlings is not discussed from this point of view.

The author agrees in general with Melin's views [ibid., v, p. 246], with sufficient acceptance of Stahl's hypothesis to cover all soil types in which mycorrhiza are freely formed, and in this respect takes strong exception to Hatch's statement that her researches were 'planned from the viewpoint of the nitrogen theory'. They were in fact planned principally to give experimental proof of the 'critical importance of mycorrhiza normal for the species in the nutrition of young trees', and her statement that seedlings already present in the area concerned appeared to be chronically starved of nitrogenous constituents was not meant to exclude the probability of deficient supplies of other essential nutrients. The experiments served to confirm the circumstantial evidence already in existence that there is a direct causal relation between normal mycorrhizal development and healthy growth. Finally, Hatch offers no comment on the author's experiments with organic composts described in her second paper of 1936, though this was published nearly a year before Hatch's work.

Hahn (G. G.) & Ayers (T. T.). **Failure of Dasyscypha willkommii and related large-spore species to parasitize Douglas Fir.**—*Phytopathology*, xxviii, 1, pp. 50–57, 1 fig., 1938.

Artificial inoculations and field observations indicate that, under United States conditions, the European larch canker parasite, *Dasyscypha willkommii*, does not grow either parasitically or saprophytically on the blue form [var. *glauca*] of Douglas fir (*Pseudotsuga taxifolia*) [*R.A.M.*, xvi, p. 220]. *D. calycina* and *D. oblongospora* have occasionally been found fruiting on dead Douglas fir branches in the area of Massachusetts where *D. willkommii* was originally detected in 1927 on imported European larch [ibid., vii, p. 285], and were induced to grow on dying, but not on healthy, living, tissues of *P. taxifolia*. The morphological characters of artificially produced apothecia of *D. calycina* and *D. oblongospora* were identical with those described for the same organs occurring in nature. Another member of the large-spored group, the native *D. occidentalis*, has also not been observed on Douglas fir in nature and failed to grow in inoculation experiments.

True (R. P.). **Gall development on Pinus sylvestris attacked by the Woodgate Peridermium, and morphology of the parasite.**—*Phytopathology*, xxviii, 1, pp. 24–49, 3 pl., 6 figs., 1938.

The life-cycle of the Woodgate rust (*Peridermium* sp.) of *Pinus sylvestris* [*R.A.M.*, xv, p. 124] was followed histologically from the penetration of the epidermis of the current season's shoot by aecidial germ-tubes, through gall formation, to the production of pycnidia two years after penetration, and the repeated formation of aecidia in the ensuing season. In addition to naturally infected material available for examination, 140 inoculations were made on 27 trees, 9 to 30 years old, situated in the affected area near Woodgate, New York, from 1930 to 1933, during which period susceptibility was found to reach a climax in the first half of June.

The wide variety of initial response of single susceptible twigs to invasion indicates the existence of more than one physiologic race of the rust. Mycelia causing little early abnormality in the invaded tissues are considered to be compatible with the host. Incompatible mycelia induce the production of starches, fatty substances, and tannin-like compounds in the host cells adjoining the hyphae, which eventually die, together with the rust. The more compatible mycelia advance beyond this necrotic area and succeed in forming galls, but cellular hypertrophy, hyperplasia, and barrier erection often impede their passage through the cortex. Compatible mycelia invade the matured secondary tissues by the end of the first season, causing little structural change, while others may be delayed. Phloem and xylem are invaded mostly along the medullary rays. The presence of the fungus in the cambium causes the formation of abnormal secondary tissues of both phloem and xylem, both regions undergoing an increase in the size of the cells and the latter also in their number. Irregularities in the size, shape, and pitting of the tracheids may also be observed. Starches, fatty substances, and tannins are laid down both in the mature stelar parenchyma and in the abnormal secondary tissues. During the third season of infection the starch and fats in the affected parenchymatous xylem tissues are replaced by tannin-like compounds, causing the cessation of conduction and sometimes resulting in the death of the branch beyond the gall. Meanwhile, the death of the inner cortical and abnormal phloem cells cuts off the external portions of the cortex from radial conduction, leading to necrosis, collapse, and subsequent exfoliation of these portions, except at the edges, where they remain as a raised collar.

Early in May, two-year-old galls frequently bear pycnidia concealed immediately beneath the periderm below the sunken central area, this being the first report of these organs for the Woodgate rust. Three-year-old galls frequently produce confluent aecidia from extensive dense mycelial wefts in the depressed region developing just below the place of the exfoliated pycnidia. Each year the tissues containing the aecidial weft are exfoliated by a periderm arising internal to them, and the next year aecidia are formed below the new periderm.

A comparison of ash analyses of two- and four-year-old galls with those of uninfected portions of susceptible trees showed the galls to be significantly lower in silicon and higher in nitrogen, phosphorus, and sulphur contents.

Preliminary cytological studies demonstrated the cells of the perennial vegetative mycelium to be predominantly uninuclear. Two, three, and rarely four nuclei appear in the cells at the base of the aecidial chain, the young aecidiospores, and many parts of the germ-tubes, but the last named are mainly uninucleate when they enter the host.

CAMPBELL (W. A.). **The cultural characteristics of the species of Fomes.** —*Bull. Torrey bot. Cl.*, lxv, 1, pp. 31–69, 128 figs., 1938.

The studies reported in detail in this paper were undertaken for the primary purpose of working out a practical system for the rapid identification of wood-destroying fungi in pure culture, and included 31 species of *Fomes*, the cultural characteristics of which on malt agar

under controlled environmental conditions are described. The results indicated that these characteristics are sufficiently distinctive to make the identification of the different species fairly certain, and that individual isolates of a given species retain their peculiarities for indefinite periods of time. Listed in the descending order of diagnostic value the macroscopical features are stated to be colour of mat, rate of growth in terms of diameter of colony at some definite time interval, texture of mat and production of coloured zones, and sometimes odour; the microscopic features are presence or absence of clamp-connexions, production of secondary spores, existence of supplementary structures such as cuticular bodies, staghorn branches, hyphal swellings, and the like, and hyphal dimensions. The species of *Fomes* also differed in their temperature relations, and most species showed a decided response to light. Tannic and gallic acids, when added in 0·5 per cent. concentration to malt agar, gave a fairly positive means of distinguishing between the white and the brown rot fungi. A key based on cultural characters is given for the species of *Fomes* studied.

Tchastoukhin (V. J.). Исследования по физиологии грибов. I. Домовые грибы. **Coniophora cerebella** и **Merulius lacrymans.** [Investigations on the physiology of fungi. I. The house fungi *Coniophora cerebella* and *Merulius lacrymans*.]—*Acta Inst. bot. Acad. Sci. U.R.S.S., 1938*, Ser. IV (*Bot. exp.*), 3, pp. 453–534, 18 figs., 1938. [French summary.]

The author describes at some length an apparatus specially constructed by him for culturing fungi in synthetic solutions under strictly aseptic conditions and in controlled atmospheres. He gives an account of the results of his studies on the growth and metabolism of *Merulius lacrymans* and *Coniophora cerebella* [*C. puteana*: *R.A.M.*, xvii, p. 282] in nutrient solutions. It was found that in media with 1 per cent. peptone and 2 per cent. glucose *M. lacrymans* developed much more slowly than *C. puteana*. The latter was shown to form large quantities of organic acids which are exuded into the medium, the final P_H value of which in some cases was as low as 2, although observations indicated that practically no growth of the fungus occurred at P_H 2·7; the optimum P_H was between 5 and 6 in solutions with 0·1 to 0·5 N glucose concentrations. For *M. lacrymans* the optimum in 0·1 N glucose solution was P_H 5, but it was found that the fungus grew consistently better at P_H 3·2 than at 3·9, a point which is being further investigated as it has not been previously recorded for this organism. It also acidified the substratum to final P_H values below 2, and resumed its growth after the medium was replaced by a fresh solution in the flasks. Both fungi freely utilized glucose, levulose, lactose, and maltose, but not saccharose, only 50 per cent. of which was used by *C. puteana* and 28 per cent. by *M. lacrymans* in one month. The polysaccharides dextrin, starch, and cellulose were easily assimilated. No enzymes were found in the medium of cultures of *M. lacrymans*, but maltase and diastase was found in that of *C. puteana*, the mycelium of which was also shown to contain saccharase. *M. lacrymans* was able to utilize inorganic nitrogen compounds, but not *C. puteana*, which only grew in the presence of organic compounds, though its adult

mycelium could use inorganic nitrogen in the form of ammonium salts of organic acids. Neither fungus could use peptone alone as a source of carbon or nitrogen. In a separate series of tests it was shown that in 1 per cent. peptone and 2 per cent. glucose solution the growth of *C. puteana* was inhibited by 0·19 per cent. zinc chloride or 0·06 per cent. sodium fluoride, and that of *M. lacrymans* by 0·01 and 0·05 per cent. of these substances, respectively, the young mycelium being considerably more susceptible to the action of the fungicides than the older. When the nutrient medium under the mycelial mats in flask cultures was replaced by a fresh one containing high doses of the fungicides, the first effect was a marked stimulation of the fundamental physiological processes of the organisms, rapidly followed by complete depression.

Hörning (F.). **Fensterimprägnierung—ein Gebot der Zeit.** [Window impregnation—a modern necessity.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 1, p. 4, 1 fig., 1938.

Excellent results are stated to have been obtained in the writer's nursery-garden in Westphalia by the impregnation of pine wood window frames for 24 hours in a wooden trough, 5 m. long, 25 cm. high, and 25 cm. broad, half full of a 5 to 10 per cent. solution of copper sulphate. Since about 1,250 frames can be treated with 50 kg. copper sulphate at a total cost of Rm. 25 the outlay involved is negligible in comparison with the great increase of durability thus secured. Woodwork immersed 15 years ago in copper sulphate has remained in excellent condition and shows no sign of damage from constant exposure. The method is also applicable to boards and stakes.

Bennett (R. G.). **Some principles of wood preservation observed in the treatment of telegraph poles.**—*J. Soc. chem. Ind., Lond.*, lvii, 2, pp. 27–31, 4 figs., 1938.

This is an interesting discussion of the principles that have been observed by the British Post Office during the past century in the preservation of telegraph poles.

Scots pine [*Pinus sylvestris*] poles are now used exclusively, and the official specification requires that the sapwood should extend to about one-third of the radial depth of the pole; if it is too shallow the protective belt of preserved wood is ineffectual, if too deep the cost of treatment is unduly high.

Trees should not be felled when the sap is 'up', and in no case outside the limits of the normal winter season in the Northern Hemisphere, i.e., before 1st November or after 1st March [see next abstract]. The presence of abundant sap renders the green wood very liable to fungal attacks, and, when dried, the deposits of albuminous and resinous matter in the outer layers and on the wood surface impede the injection of preservatives. 'Floated' poles season more effectively and retain preservative materials better than those not so treated. The poles are carefully stacked to ensure good seasoning, and only when the moisture content of the green wood has been reduced by thorough aeration to 25 per cent. of the weight of the dry wood should preservative treatment be applied.

In 1931 the Post Office discontinued Bethel's full-cell method of impregnation in favour of Rueping's empty-cell process [ibid., xvii, p. 2]. Creosote is used at a rate of not less than 12 lb. (just over 1 gal.) per cu. ft. of wood. The oil pressure may amount to as much as 185 lb. over a one-hour period. On the release of the pressure the air expands and 'kicks back' nearly two-thirds of the injected creosote. A negative pressure of as near 28 in. as the pumps will reach is applied to assist the evacuation of the free creosote. The entire process takes three to four hours. None of the preservatives hitherto tested has proved so uniformly reliable as creosote, some 8,000 poles treated with which between 1866 and 1886 are still standing.

GÄUMANN (E.). **Der Einfluss der Fällzeit auf die Dauerhaftigkeit des Holzes.** [The influence of the felling time on the durability of wood.]—*Schweiz. landw. Mh.*, xvi, 1, pp. 1–11, 1 fig., 11 graphs, 1938.

This is an abridged account of the writer's investigations in Switzerland on the time of felling in relation to the fungal decay of spruce, fir, and beech wood, fuller versions of which have already been noticed from other sources [*R.A.M.*, xvi, p. 354].

VINCENT, HERVIAUX, & COÏC. **Influence de la cyanamide sur la hernie du Chou.** [The influence of cyanamide on club root of Cabbage.]—*C. R. Acad. Agric. Fr.*, xxiv, 3, pp. 83–86, 1938.

In an experiment at the Finistère [Brittany] Agricultural Experiment Station on the control of club root of Milan cabbage (*Plasmodiophora brassicae*) [*R.A.M.*, xv, p. 70], the best results were obtained by the addition to the stable manure of 90 kg. nitrogen in the form of cyanamide per plot of 60 plants, applied with the harrow 20 days before sowing. The percentage of infection in the two plots thus treated was only 22 compared with 47 for those receiving manure alone, 58 for those treated with manure plus calcium nitrate, and 30, 48, 45, and 42 for those receiving cyanamide at sowing, sowing and covering over, and 10 and 20 days after sowing, respectively.

LARSON (R. H.) & WALKER (J. C.). **Properties and host range of a Cabbage mosaic virus.**—Abs. in *Phytopathology*, xxviii, 1, p. 13, 1938.

Natural overwintering hosts of the cabbage mosaic virus [*R.A.M.*, xvi, p. 518] of south-eastern Wisconsin include *Capsella bursa-pastoris* and *Thlaspi arvense*, the vectors of the disease being *Myzus persicae* and *Brevicoryne brassicae*. The virus is inactivated by ten minutes' exposure to a temperature of 55° C., but remains infectious *in vitro* for two days at 20° to 22° and in dilutions up to 1 in 1,000. Systemic infection was obtained on all the cultivated and wild species of *Brassica* tested, *Hesperis matronalis*, *Cheiranthus allionii*, *Matthiola incana*, which developed floral breaking and petal variegation [ibid., xv, p. 98], spinach, Swiss chard [*Beta vulgaris* var. *cicla*], sugar beet, *Zinnia*, *Calendula*, *Nicotiana bigelowii*, *N. glutinosa*, *N. langsdorffii*, *N. multivalvis*, *N. quadrivalvis*, and *N. rustica*. Local lesions were produced on Connecticut Havana No. 38 tobacco, *N. calyciflora*, *N. sylvestris*, the F_1 hybrid

of *N. tabacum*×*N. glutinosa*, and *N. repanda* (followed by systemic infection in the last-named).

TOWNSEND (G. R.). **Reactions of varieties of Snap Beans to rust.**—*Plant Dis. Reptr*, xxii, 1, pp. 2–4, 1938. [Mimeographed.]

Rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: *R.A.M.*, xvii, p. 287] became epidemic on snap beans [*Phaseolus vulgaris*] in southern Florida during the winter and spring of 1935–6 and 1936–7, several thousand acres of the Bountiful and Black Valentine varieties failing completely, though on other occasions and in other localities these varieties have been reported as tolerant or resistant. As a result of trials of ten varieties of snap beans carried out in Florida, Georgia, Maine, Virginia, and other parts of the United States it was found that the reaction of the varieties varied considerably from one locality to another, presumably according to the rust races present or to environmental factors. One variety, 6651, a rust-resistant selection from brown-seeded Kentucky Wonder beans, appeared to be highly resistant or tolerant in every locality where it was tested.

BONDARTZEVA-MONTEVERDE (Mme V. N.) & VASSILIEVSKY (N. I.). Аскохитоз Гороха. [Ascochytosis of the Pea.]—88 pp., 15 figs., 4 diags., U.S.S.R. Acad. Sci. Press, Moscow, 1937. [English summary.]

The results of the authors' studies from 1930 to 1932 at the Botanical Institute of the U.S.S.R. Academy of Sciences, near Leningrad, on the phytopathological analysis of a very large number of pea seed samples, showed that the two major diseases of peas in the Soviet Union are caused by *Ascochyta pisi* and *Didymella* (*Mycosphaerella*) *pinodes* [*R.A.M.*, xvi, p. 435; xvii, p. 287], the first of which is apparently present wherever peas are grown, but is most prevalent and injurious to the crop in districts of European Russia and the Ukraine with comparatively high rainfall; the second occurs chiefly in the northern and central provinces. While the presence of *A. pinodella* [loc. cit.] was not established in Russia, a fungus agreeing closely with Jones's diagnosis but differing in the dimensions of the conidia (which measured 8 to 12 by 3 to 4 μ) was isolated from pea seeds from several localities; the fungus, which is named *A. pseudopinodella* n.sp. [with a Latin diagnosis], was shown experimentally to cause a leaf spot very similar to that due to *A. pisi*, but consistently failed to produce root or crown rot.

A. pisi and *M. pinodes* were shown in cross-inoculation experiments involving 24 different species of Leguminosae to be weakly pathogenic to certain other species of the family besides the pea, for the most part only causing the appearance of isolated spots on a few leaves. Further studies indicated the existence of five forms of *A. pisi* and three forms of *M. pinodes*, differing from one another in cultural characters and also somewhat in their pathogenicity. In pea seeds *A. pisi* was found to retain its viability for at least six years, and *M. pinodes* for about five years.

The other fungi which were most frequently met with in the pea samples examined included three [unnamed] species of *Fusarium*, one

of which was especially common and considerably lowered the germinability of the seed. An unidentified species of *Alternaria* was found fairly frequently inside pea seeds, especially from Siberia, but did not appear to affect their viability appreciably. Bacterial infection of the seed was fairly common, and among the moulds *Penicillium glaucum* was the most prevalent. Three samples were found to be heavily infected with *Moniliopsis aderholdi* [ibid., xvii, p. 183] which, in germination tests, invariably killed the affected seedlings.

Roland (G.). **Quelques jaunissements des feuilles de Betteraves.** [Some yellowings of Beetroot leaves.]—Reprinted from *Ann. Gembl., 1938*, 18 pp., 8 figs., 1938.

Brief semi-popular notes are given on a number of diseases and conditions producing a yellow discoloration of beet leaves, including mosaic; 'jaunisse' or yellow spot [virus yellows: *R.A.M.*, xv, p. 548]; yellowing due to *Pythium* sp. [ibid., xiv, p. 209]; 'yellows' caused in Colorado by *Fusarium conglutinans* var. *betae* [ibid., x, p. 428], but not found by the author in Belgium; a condition associated sometimes with a *Verticillium* and at other times with a *Fusarium*, in which a lemon-yellow discoloration generally affects half the blade of the oldest leaves, and the petiole may be discoloured and become necrosed; and the forms of yellowing caused by magnesium [ibid., xvi, p. 649], manganese, and copper deficiencies. A bibliography of 31 titles is appended.

Kirchhoff (H.). **Zur Blattfleckenkrankheit der Zuckerrüben.** [On the leaf spot disease of Sugar Beets.]—*Dtsch. landw. Pr.*, lxv, 1, p. 8, 1938.

In 1937 the recognition of beet leaf spot (*Cercospora beticola*) in the Kleinwanzleben district of Germany [*R.A.M.*, xvii, p. 284] was complicated by the simultaneous presence of *Alternaria tenuis* [ibid., xvii, p. 220]. The differences in the intensity of attack repeatedly observed during the past season are attributed, not to diverse varietal reactions to the fungus, which indiscriminately infects all the cultivated strains and even wild beets, but to variations in nitrogen supply. Late applications of nitrogen (end of June to early July) were found to effect a substantial reduction of infection, thereby confirming the results of previous trials in Upper Austria.

Buchholtz (W. F.) & Meredith (C. H.). **A Sugar-Beet root rot caused by Aphanomyces cochlioides.**—Abs. in *Phytopathology*, xxviii, 1, p. 4, 1938.

In August and September, 1937, *Aphanomyces cochlioides* [*R.A.M.*, x, p. 742] was isolated from the decayed tap-roots of a random sample of sugar beets from Kanawha [Iowa] showing 61 per cent. infection. The lesions produced by the fungus were brownish, water-soaked, and slightly soft; many of the roots had become so desiccated and shrunken that only a fibrous, tassel-like structure remained. Such plants showed symptoms of severe wilting eventually ending in death, though this was sometimes delayed by the abundant formation of short slender side roots. Two plug-inoculation experiments in the field resulted in 100 and 91 per cent. infection, while a similar test on harvested beets caused

91 per cent. rot. The symptoms induced by *A. cochlioides* differed from those following inoculation with *Phytophthora drechsleri* [ibid., xv, p. 550], and the former was reisolated in each of the above-mentioned trials. In typical cultures zoospores emerged as delimited protoplasts from unbranched hyphae and became motile in twelve hours. Oogonia, 24 to 29 μ, with branched, enveloping antheridia, were present in two-day-old cultures.

HASSEBRAUK (K.). **Botrytis cinerea Pers. als Spargelschädling.** [*Botrytis cinerea* Pers. as a pathogen of Asparagus.]—*NachrBl. dtsch. PflSchDienst*, xviii, 1, pp. 2–4, 2 figs., 1938.

In 1937 the chlorosis, wilting, and die-back of asparagus caused by *Botrytis cinerea* assumed an exceptionally virulent form in Germany, the development and spread of the fungus no doubt being favoured by the abnormally heavy precipitation from May to August inclusive. The diseased plants almost invariably bore pycnidia, aecidia, and uredosori of *Puccinia asparagi* [*R.A.M.*, xvi, p. 238], the normally profuse growth of which, however, was apparently suppressed by *B. cinerea*. The latter fungus also occurred on rust-free plants grown in specially constructed isolation 'cages', infection in such cases presumably taking place through insect injuries. Preliminary experiments in the elimination of *B. cinerea* by three applications of 2 per cent. Wacker's Kupferkalk on 15th July, 10th August, and 1st September, at the rate of 400 l. per hect. for the first treatment and 500 for the two following, gave promising results, the incidence of infection on three sprayed plots being 2·2, 11·8, and 22·3 per cent. compared with 31·7, 54·6, and 55 per cent., respectively, on the untreated controls.

JOHNSON (H. W.) & LEFEBVRE (C. L.). **Crotalaria mosaic.**—Abs. in *Phytopathology*, xxviii, 1, pp. 10–11, 1938.

A disease characterized by general stunting of the plants, foliar mottling, blistering, and malformation, and abnormally profuse lateral branching (witches' broom) was prevalent in the *Crotalaria* nursery at the Arlington (Virginia) Experiment Farm in 1937, the percentages of infection among the various species being as follows: *C. striata* 86·7, *C. usaramoensis* 76·2, *C. intermedia* 71·6, *C. maxillaris* 58·1, *C. incana* 57·3, *C. spectabilis*, early and late strains, 46·2 and 33·3, respectively, and *C. lanceolata* 31·8, *C. retusa* being unaffected. From 50 to 67 per cent. positive transmission of the virus from *C. spectabilis* and *C. usaramoensis* to *Vicia faba* plants was secured by rubbing the leaves with cheesecloth soaked in mosaic extract, using white quartz sand as an abrasive. The incubation period of the virus was 14 days. Witches' broom or curly disease of *C. anagyroides* and *C. juncea* was reported from Java in 1927 [*R.A.M.*, vii, p. 380], but the present record of the disorder is believed to be the first for the United States.

LAYTON (D. V.). **The parasitism of Colletotrichum lagenarium (Pass.) Ell. and Halst.**—*Res. Bull. Ia agric. Exp. Sta.* 223, pp. 37–67, 12 figs., 1937.

The author measured the relative resistance of cucurbits to anthracnose, caused by *Colletotrichum lagenarium* [*R.A.M.*, xvi, p. 439; xvii,

p. 157], by growing plants from several thousands of seeds together with a standard susceptible check variety (commercial Kleckley Sweet) in duplicate pots, previously steam-sterilized. After inoculation of the plants with spore suspensions of the fungus, they were placed in a moist chamber for 14 to 16 hours at temperatures of 15° to 17° C. and 20° to 30°. They were then kept under observation in ordinary greenhouse conditions, and it was found that no infection resulted from exposure to 15° to 17°, but severe infection from exposure to the higher temperature. A description is given of the typical symptoms of anthracnose, and six species (*Cucurbita texana*, *C. foetidissima*, *Ibervillia tenuisecta*, *Apodanthera undulata*, *Sicyos parviflorus*, and *Luffa* sp.) are added to the host range. Previously unrecorded early symptoms on watermelon in the field consist of small, raised, water-soaked areas located along the vines near the crown of the plant. Of all genera studied *Cucurbita* was found generally to be the most resistant and *Cucumis* and *Citrullus* the most susceptible to anthracnose. The comparative resistance or susceptibility is given of 836 selections and varieties (165 foreign) of watermelon, 139 of cantaloupe, 18 of cucumber, and 21 of *Cucurbita* spp. Detailed information is also given on the breeding of varieties resistant to anthracnose and wilt [*Fusarium bulbigenum* var. *niveum*], a preliminary announcement of which has already been noticed from another source [ibid., xvi, p. 439].

Flachs (K.). **Schädlinge und Krankheiten des Champignons.** [Mushroom pests and diseases.]—*Prakt. Bl. Pflanzenb.*, xv, 8–9, pp. 247–267, 7 figs., 1938.

This is an account of the symptoms and etiology of some well-known insect pests and fungal, bacterial, and non-parasitic diseases of mushrooms [*Psalliota* spp.] in Germany and other countries, with indications for their control.

L. (M.). **L'utilisation du chauffage électrique dans les Champignonnières.** [The employment of electric heating in Mushroom beds.]—*Rev. hort., Paris*, cx, 1, pp. 15–17, 1 fig., 1938.

During the preliminary stages of mushroom [*Psalliota* spp.] culture a soil temperature of 15° to 18° C., approximating to that of the surrounding atmosphere, is high enough for the beds, but during the harvest increased ventilation lowers the temperature of the houses to between 10° and 15°, which should be exceeded in the beds by about 10°. The problem of temperature adjustment may be solved by the installation in the bed of a lead-covered electric heating wire, the heat furnished by which effects a reduction of 50 to 75 per cent. in the quantity of manure required at a consumption of 1 kilowatt-hour daily for 5 yds. of bed yielding an average of 35 to 40 kg. mushrooms during a two-month harvest.

Mundkur (B. B.). **Host range and identity of the smut causing root galls in the genus Brassica.**—*Phytopathology*, xxviii, 2, pp. 134–142, 3 figs., 1938.

Latin and English diagnoses are given of *Urocystis brassicae* n.sp.,

the name applied after further extensive studies to the [Indian] mustard (*Brassica campestris* var. *sarson*) smut previously identified as *U. coralloides* [*R.A.M.*, vii, p. 554]. The spore balls of *U. brassicae* measure 25 to 58 by 20 to 45 μ (mean 38 by 32 μ), with 1 to 5, mostly 2 or 3 fertile cells, the deep brown, fertile spores 13 to 25 by 9 to 20 μ (20 by 16 μ), surrounded by numerous bright brown, elongated, sterile spores, 5 to 15 by 3 to 10 μ (9·9 by 6·1 μ), forming a continuous layer. All these organs are larger in *U. brassicae* than in *U. coralloides*. The spores of *U. brassicae* are formed in wart-like, tuberculate, leaden-grey galls, ranging in size from that of a pea to $1\frac{1}{2}$ in. in diameter, in the underground parts of Indian mustard and (in inoculation experiments with naturally and artificially infected soil) in those of turnip, rape, radish, cabbage, black mustard (*B. nigra*), and *B. juncea*. *U. brassicae* proved to be incapable of infecting *Turritis glabra* and *Matthiola sinuata*, to which *U. coralloides* is pathogenic. Indian mustard plants grown in infested soil flower some five days earlier than those in smut-free soil, and seed formation is adversely affected by the fungus.

GIESECKE (F.) & SCHUPHAN (W.). **Über die Ursachen der 'Rost- oder Eisenfleckigkeit' des Knollenselleries und ihre Behebung bei der Konservierung.** [On the causes of the 'rust- or iron-spot' of Celeriac and its prevention in storage.]—*Z. Untersuch. Lebensmitt.*, lxxv, 2–3, pp. 157–167, 1938.

Further studies on the 'rust- or iron-spot' responsible for serious depreciation in the market value of German celeriac [*R.A.M.*, xvi, p. 652] indicate that the enzyme involved in the discoloration is a peroxidase. In an experiment to determine the influence of heat on the development of the defect, very severe symptoms were observed after two hours on the sliced rootstocks exposed to temperatures of 25°, 46°, and 68° C., but not on those kept at 4° or 87°. The discoloration further increased parallel with the rising alkalinity of the blanching liquid. The prevention of the blemish in stored celeriac may be effected by slicing the rootstocks in ice-cold water and subsequently transferring them straight into boiling water for blanching.

PADWICK (G. W.). **Complex fungal rotting of Pea seeds.**—*Ann. appl. Biol.*, xxv, 1, pp. 100–114, 2 pls., 1938.

After surveying the literature dealing with parasitic diseases of peas the author gives an account of his studies of the fungal flora isolated from pea plants from experimental plots with poor stands in five widely separated pea-growing districts of England. Isolations from the pea seeds sown in the plots, which had been treated with various disinfectants, showed that they were to a very great extent free from parasitic fungi, and indicated that the depleted stands in the plots were not caused by seed-borne *Ascochyta pisi* or *Mycosphaerella pinodes*. Tests of four commercial varieties of peas, known to suffer from poor germination, showed that the cotyledons contained an abundance of common moulds, and several pathogens, including a *Fusarium* of the *roseum* section, *F. culmorum*, and *Botrytis cinerea*. Isolations from surface-sterilized rotting stems from the experimental plots at harvest time

indicated the presence on them of a great variety of fungi, many of which proved to be non-pathogenic to the cotyledons. Among the pathogens *F. avenaceum* was shown to have a high degree of virulence and *F. solani* var. *martii* showed some signs of causing rotting. *B. cinerea* was highly aggressive. Inoculation tests with numerous stock cultures showed the high susceptibility of the pea cotyledons to *B. cinerea* from lettuce, rose, and other hosts, *F. avenaceum* from wheat, *F. culmorum* from wheat, *Dianthus*, and *Callistephus*, species of *Fusarium* from broad beans (*Vicia faba*) and tulips, *Helminthosporium sativum* from wheat, *Ophiobolus heterostrophus* [*R.A.M.*, xiii, p. 366] from rice, *Sclerotinia* sp. from lettuce, and *F. graminearum* [*Gibberella saubinetii*] from wheat.

The results of the work are considered to indicate that the rotting of the cotyledons of pea seeds in the soil is a complex disease, caused by various fungi such as those enumerated above, and that loss of stand due to this rotting is probably more important than the diseases caused by *A. pisi* and *M. pinodes* and foot rots in the later stages of growth.

LÖHNIS (M[ARIE] P.). **Brown heart in Swedes (Brassica napus rapifera).** —*Chron. bot.*, iv, 1, p. 9, 1938.

Swede seedlings were grown at the Wageningen (Holland) College of Agriculture in van der Crone's nutrient solution with the addition of traces of manganese, copper, aluminium, and iodine, and of boric acid at the rates of 0·125, 0·25, and 0·5 mg. per l. The roots were examined after 3½ months and all except those supplied with boric acid at the highest rate revealed abnormalities of the cambial cells identical with those observed in field plants suffering from brown heart [*R.A.M.*, xvii, p. 284].

MARSAIS (P.). **Le court-noué parasitaire de la Vigne.** [Parasitic court-noué of the Vine.]—*Rev. Path. vég.*, xxv, 1, pp. 33–45, 3 figs., 1938.

This is an expanded version of the author's recent paper on the latest developments in the study of the parasitic court-noué of the vine (*Pumillus medullae*) [*R.A.M.*, xvii, p. 291].

LIRO (J. I.). **Die wichtigsten Daten der Pflanzenschutzgesetzgebung Finnlands.** [The most important data of plant protection legislation in Finland.]—*Veröff. LandwMinist.*, 19, 17 pp., Helsingfors, 1937. [Abs. in *Rev. appl. Ent.*, Ser. A, xxvi, 4, p. 201, 1938.]

This is a summary of the legislation regulating the importation into Finland of plants and plant products.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xii, 2, p. 32, 1938.

CHILE. Under the terms of Decree No. 536 of 20th August, 1937, avocado pears imported into Chile from Peru must be free from infection by anthracnose (*Physalospora* [*Melanops*] *perseae*) [*R.A.M.*, xiv, p. 124], and must further originate in regions where the cankers produced by the fungus have been almost entirely eradicated and a continuous system of elimination is operative.